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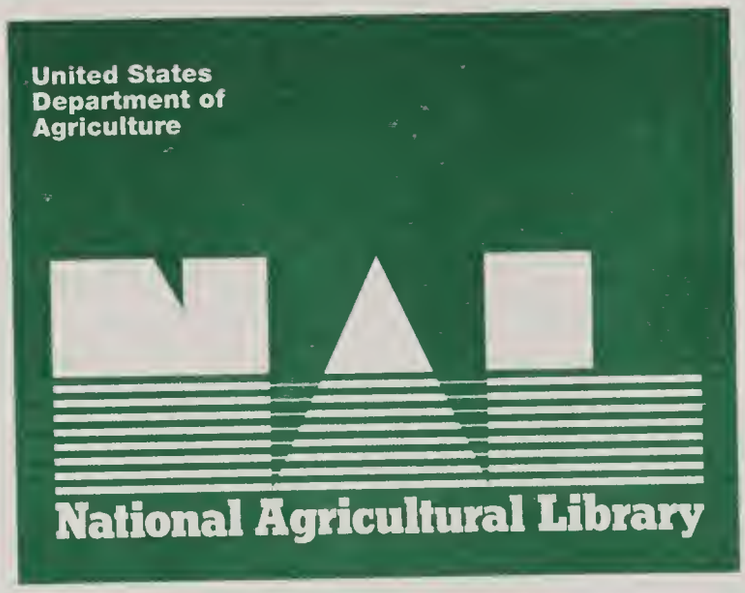
Rural America and the Changing Structure of Manufacturing

Spatial Implications of New Technology and Organization

A Conference Proceedings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Abstract

The type of job and income growth that manufacturing industries will provide for rural economies is one of the most important rural development questions of the 1990's. While manufacturing will undoubtedly continue to play a significant role in rural economies, the effects upon rural economies of dramatic worldwide restructuring of manufacturing are unknown. This report explores many of the issues associated with the restructuring of manufacturing industries and their implications for rural growth. The chapters were originally presented at a workshop in Washington, DC, September 24-25, 1992. The workshop was co-sponsored by the Economic Research Service of the U.S. Department of Agriculture and the University of Guelph in Ontario, Canada.

Keywords: manufacturing, restructuring, rural, rural growth.

Note: The views expressed in herein are those of the contributors and do not necessarily represent the views of the U.S. Department of Agriculture.

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Preface

One of the most important rural development policy questions for the 1990's is what type of job and income growth will manufacturing industries provide for rural economies. Since manufacturing accounts for such a large share of both income and jobs, there is little doubt that it will continue to play a significant role in many rural economies. Because of the dramatic restructuring occurring in manufacturing industries throughout the world, it is far from certain that rural manufacturing will provide the basis for vigorous economic growth.

Many characteristics of the emerging new manufacturing industry point to an erosion of the competitive advantage of many rural areas. Rapid changes in both markets and technology are forcing manufacturing firms to make radical changes in all aspects of their operations. For instance, as manufacturers adopt a more flexible manufacturing process, they may need closer coordination with their suppliers and customers. As the importance of close coordination rises, the distance penalty of locating in rural areas may also increase. The purpose of this report is to explore many of the issues associated with manufacturing restructuring and their implications for future rural growth.

The chapters were originally presented at a workshop held in Washington, DC, on September 24-25, 1992. The workshop, co-sponsored by the Economic Research Service and the University of Guelph, brought together scholars and researchers from the United States and Canada to discuss how the changes brought about by manufacturing restructuring are likely to affect the spatial distribution of manufacturing activity. The report is divided into two parts. The first four chapters address issues related directly to the restructuring occurring within manufacturing. The five chapters of the second part address a wider range of issues, such as the effects of international trade relations and the impacts of restructuring on communities and wage inequality.

In the first chapter, Malecki provides a broad overview of the major issues involved in the emerging new manufacturing economy. He concludes that many changes in the structure of manufacturing, especially those associated with the adoption of more flexible production methods and organizations, may make it even more difficult for rural areas to compete in national and global markets. According to his analysis, a critical determinant of the competitiveness of rural areas will be the existence of efficient outward-looking networks and information sources.

An important aspect of the changes occurring throughout manufacturing is the adoption of new production processes. Gertler examines the problem of adoption of more flexible production technologies. Effective adoption of new technology is likely to become an increasingly important factor in determining whether firms are able to successfully compete in global markets. Gertler concludes that the social context in which production technology is developed and used is critical to successful adoption, and many manufacturers have been unable to effectively utilize machinery and production technology developed by other nations.

The role of producer services is taken up next. As manufacturing firms adopt more flexible techniques, the demand for producer services rises. MacPherson examines the importance of external producer services to small- and medium-sized manufacturing firms. He finds that firms without ready access to a wide range of technical producer services tend to be less dynamic, less innovative, and less export-oriented. He also finds that even though producer services tend to

concentrate in urban centers and that local access can be an advantage, local provision of producer services is not essential. Many of these services are often imported from considerable distances. Thus, the lack of a wide range of local producer-service activity may not be an insurmountable handicap to rural manufacturers.

Coffey takes a slightly different view of producer services. He looks at both the question of whether producer services can provide significant numbers of jobs in rural areas and whether the relative absence of producer services is a significant handicap for rural manufacturers. His analysis of recent trends in Canada leads him to the conclusion that there is little reason to be optimistic that producer services will ever be a substantial source of jobs in rural areas. As he points out, some growth of producer services in rural areas will occur, but a policy of encouraging the growth of producer services that fails to address both the supply of and demand for producer services is unlikely to meet with much success.

One of the most striking aspects of the new manufacturing economy is that it is becoming increasingly global. Rural areas are no longer competing just with urban areas for jobs but are also facing strong competition from abroad. Glasmeier, Thompson, and Kays discuss how this increasing globalization of manufacturing may have adverse impacts on the rural manufacturing base. They look specifically at how international trade agreements may affect the competitiveness of rural textile and apparel producers.

Christopherson and Redfield examine the potential role of industrial districts in creating a regional competitive advantage for rural areas. As Malecki pointed out, newly formed industrial districts have been an important mechanism by which a number of small regions in Europe have become more competitive in global markets. Christopherson and Redfield discuss how institutional and other constraints make the creation of industrial districts similar to those found in Europe difficult. Their analysis thus raises strong doubts about the efficacy of local development policies which attempt to create or encourage industrial districts for rural areas.

A recurring theme throughout the workshop was the importance of adopting new production methods. Because many of the most important technologies involve expensive machinery, a key factor in determining the success of any modernization effort in rural areas is the ability of small- and medium-sized manufacturing firms to acquire sufficient capital. Harrington addresses this issue by analyzing the effects of the current wave of financial reform and consolidation on the availability of adequate financing. He concludes that one of the most important implications of the changing financial system is that the loss of locally owned and operated financial institutions may make it even more difficult for small, nonconforming borrowers to get credit. Unfortunately, this group of borrowers is likely to include many small manufacturers in rural areas.

Gorham looks at how the restructuring in manufacturing during the 1980's affected rural workers. She shows that rural workers experienced an increase in wage inequality during the 1980's. Her analysis indicates that occupational shifts within industries were much more important causes of the increase in wage inequality than were employment shifts from manufacturing to services.

In the final chapter, Freshwater examines the growth and decline of communities in the Niagara Peninsula of southern Ontario. The communities in this region are similar to those in many rural areas of the United States and Canada in their dependence on both agriculture and traditional, branch plant-based manufacturing. Thus, Freshwater's discussion of the efforts of the

communities in the Niagara Peninsula in dealing with the decline of their traditional manufacturing base provides interesting parallels with the experiences of many rural communities throughout both nations.

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Contents

Competitive Manufacturing in the 1990's: Implications for Rural Communities

Edward J. Malecki[1]

Introduction

This paper addresses two issues relating to the competitiveness of rural manufacturing in North America: first, the increased demands on firms and their workers to attain and retain competitiveness, and, second, the changes in the technology of production and organization, which can be described (with some distortion) under the "flexibility" label, which is altering the environment in which firms operate. The paper focuses on the contributors to the competitiveness of rural manufacturers and, in turn, of rural economies. There are two reasons why rural manufacturing has not received attention: (1) a renewed focus on agglomeration advantages has shifted the focus of attention to urban regions, and (2) the accumulated evidence is that the comparative advantage of rural areas in low-wage production is not a sufficient foundation for sustained economic development.

Of all the factors identified as inhibiting the indigenous potential of peripheral regions, most attention has focused on the dependence of such regions on branch plants of large, multilocational corporations. The evidence is clear that such plants tend to have lower levels of highly trained and skilled personnel, certainly lower levels of research and development (R&D), and little attention to nonroutine activities or new products (Malecki, 1981, 1990; Miller and Coté, 1987; Sweeney, 1987; Watts, 1981). Because of the routine nature of the work done in them, branch plants are less likely to involve nonroutine networking by workers and, when work is done, it is less likely to be done locally, but will be done long-distance with other nodes in the corporate network. A regional structure dominated by branch plants is particularly unlikely to be innovative, and it is more difficult for new firms to emerge. Two of the most significant processes in economic development are linkages or input-output connections among firms, and new firm formation. These two processes are higher order development dynamics, which represent ways in which an economy sustains and renews itself over time (Malecki, 1991).

Three strands of theory contribute to this paper. First, the identification of the local *milieu* is also, in part, a growing recognition of what Sabel (1989) has called "the resurgence of regional economies." In large urban regions, webs of interlinked firms in industrial *ensembles* comprise a *territorial production complex* in which agglomeration economies benefit all firms (Saxenian, 1990; Scott, 1988a, 1988b; Storper and Walker, 1989). Local *milieux* in smaller urban areas or in dispersed nonmetropolitan settings have received attention almost exclusively as industrial districts in Italy and in a few other areas in Europe. Recently, economists and others working on the success of firms have observed that the variation within industrial sectors owes much to the "locally specific" knowledge and learning that takes place within firms. Much of this knowledge

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[1] The author is professor and chair of the Geography Department at the University of Florida. Portions of this paper were taken from Malecki (1991). **Note:** The views expressed in this chapter are those of the author and do not necessarily reflect the views of the U.S. Department of Agriculture.

accumulation, in turn, is owed to the actions and networks in which the firm is involved, and these are based on individual contact networks of company employees and agents. The evolutionary theory of economic change and institutions (formal as well as informal) comprises a rich environment of learning and interaction, in contrast to the sterility of the neoclassical firm (Dosi, 1988; Dosi and Orsenigo, 1988; Lundvall, 1988; Nelson and Winter, 1977, 1982).

Second, a profusion of European research on the issue of indigenous (or endogenous) development led to recognition of locally specific development trajectories (for example, Albrechts et al., 1989; Bassand et al., 1986; Stöhr, 1990a; Stöhr and Taylor, 1981). Coffey and Polèse (1984, 1985) have proposed a model of local development which prominently featured local linkages and entrepreneurship as hallmarks of development. It has been increasingly recognized that the process of economic development is primarily a local phenomenon (Allen and Hayward, 1990; Miller and Coté 1987). The local nature of economic development in the United States is reinforced by the careful analysis presented by Miller and Coté (1987), as they analyze the possibilities for generating other "Silicon Valleys" in the United States or elsewhere (Smilor, Kozmetsky, and Gibson, 1988). They conclude that this is impossible without a number of local conditions that represent, in large part, the local interpersonal networks of individuals. The work of Doeringer, Terkla, and Topakian (1987) in western Massachusetts is one of the best examples of locality research in the United States, although it is conspicuously not connected theoretically with that line of study.

A third context for the paper is a focus on subjective (or invisible) factors in local economic development. In contrast to "visible" or objective factors, measurable by means of operational quantitative variables, subjective or "invisible" factors represent the human interactions, cultural patterns, and sharing of specific knowledge that are distinctive in each locality (Camagni and Capello, 1990; Doeringer, Terkla, and Topakian, 1987; Jackson, 1991). These factors, which comprise the *milieu* of a local production system, are the influences which serve to make development locally variable and difficult to replicate in other places (Crevoisier, 1990; Maillat, 1990a; Stöhr, 1990b). A *milieu* is first and foremost a network; it is not a place. *Milieux* contain innovative firms, not just small firms (Maillat and Lecoq, 1992).

The paper considers, first, the emerging context for competitiveness, with some emphasis on the context for small and rural firms. Attention then turns to the issue of flexibility and how this (largely theoretical) debate alters the environment within which firms operate. Finally, the paper deals with the challenge for rural producers and rural economies in a setting of increased competition.

Competitiveness

The imperative to be competitive stems from the increased globalization of competition, as manufacturers face new competitors, especially from Asia, Mexico, and elsewhere, able to produce products that meet world market standards of price, delivery, service, and quality. No sector is immune from the technologically derived standards of quality and price that are set by global, world-class firms. "Competition itself is undergoing far-reaching changes. Whereas in the past it was predominantly price-driven, it has now become technology-driven" (Stevens and Andrieu, 1991: 116). To attain productivity or efficiency, as well as product quality, requires capital, skilled labor, training to enhance labor skills, and information about markets (Hitchens et al., 1992).

Small firms find the demands of the market and their lack of resources available to them, and their general constraint to local markets, keep them less than fully informed about markets and demands elsewhere. The complexity of industrial organization, especially regarding supplies of inputs and distribution of outputs, poses great challenges to small enterprises, which often struggle to maintain competitiveness as innovation increases in importance (Howard, 1990; O'Farrell and Hitchens, 1989). The knowledge needed to compete comes most often from suppliers and customers, and from other firms in the locality. In the most well-defined industrial localities--industrial districts--the interaction among firms goes beyond mere material transactions, and these districts represent models of flexible specialization (or flexible accumulation) (Cooke, 1990).[2]

Market information, especially about export markets, is especially difficult for many small firms to obtain. Trade publications, trade shows, and directories provide formal sources of information. Informal information-gathering can be initiated at trade shows, but works largely through a contact network of individuals. These contact networks, in the right setting, also provide avenues to sources of financing and investment support (Birley, 1985). Knowledge of international markets requires both greater resources and greater management capacity, both of which may be lacking in small firms (Christensen, 1991).

The disadvantages of small size in information-gathering especially afflict firms in places where the local networks are inadequate for firm success. MacPherson's recent (1991a) work in the Buffalo, NY, area shows that it is not necessarily the local economic environment of such a declining region that leads to a lack of competitiveness, since technical information and other services can be imported. However, a striking gap appears between large firms, which generally import such information, and small firms, which by and large do not. A similar trend was found in Toronto, the United Kingdom, and the former West Germany, in all of which the more innovative firms are those with a high outward orientation and widespread networks of contacts (MacPherson, 1988; Meyer-Krahmer, 1985; Rothwell, 1991).

Many small firms are innovative, despite undertaking little or no R&D, by relying heavily on their external networks for information. Innovative small firms tend to have dense networks of connections with other small firms, in addition to links with large firms (Rothwell, 1991). It must be pointed out that R&D is not the key input or activity to measure. R&D figures will not include network activities, learning, informal R&D, and other means of enhancing a firm's (and its employees') knowledge (Malecki, 1991; Moller, 1991). Moller, for example, attributes Denmark's ability to excel in low-technology exports to these knowledge-enhancing activities. Ewers and Wettmann (1980) pointed out more than a decade ago that diffusion is more important than R&D in the generation of local innovativeness.

The innovativeness supported by local interfirm networks not only supports existing firms, it also presents opportunities for entrepreneurs to start new businesses to serve newly identified markets. The importance of networks, of market information, and of innovative niches sparks innovation in

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[2] There is some debate about the inevitability as well as the significance of flexibility, but its recent rise is clear (Amin and Robins, 1990; Gertler, 1988, 1989; Harvey, 1988; Harvey and Scott, 1989; Hudson, 1989; Lovering, 1990; Sayer, 1989; Schoenberger, 1988, 1989; Thrift, 1989). While flexibility *per se* is not the issue here, it informs any examination of small firms in contemporary economies. Indeed, "the use of the term 'flexibility' has become so common that it cannot simply be dismissed as something not worth attention" (Boyer, 1988: 222).

both high-technology industries and in traditional sectors (Ahlbrandt, 1988; Doeringer, Terkla, and Topakian, 1987; Miller, Brown, and Centner, 1987; Young and Francis, 1989). In a low-tech example, Miller, Brown, and Centner (1987) provide evidence that handicraft firms in the U.S. South (often just individual proprietors) vary greatly in competitiveness according to several "network" factors. Competitiveness in craft sectors is largely an issue of new product generation to replace old products for which cheaper imitations have become available from Asia, Mexico, and other low-cost production areas. To a lesser extent, competitiveness also involves issues of quality, which depends on production techniques. The network factors include education and training (which broadens the individual's network of contacts and information sources), the sources of information utilized for new product ideas (for example, personal contact networks, trade publications, short courses), and the extent to which one participates in trade shows, where contact with customers, suppliers, and competitors is facilitated.

A great deal of information flow among firms depends on "gatekeepers" to external networks and on informal, unplanned interaction. Especially important is information that is oriented toward national and international markets. Keeping up with industry best practice internationally is a key concern of all firms, and determines their competitiveness in a global economy (Maillat, 1990a; O'Farrell and Hitchens, 1988, 1989). For example, most small firms will not be able to keep up with the latest in computer technology, but one well-connected individual with that knowledge can influence a large number of small businesses. Gatekeeping is always largely an informal activity, and relies on a personal inclination to interact with others in social, personal, and business contact networks (Falemo, 1989). Further, within dynamic localities or communities, a key role is played by "community entrepreneurs," individuals who tend to have very large personal networks (Johannisson and Nilsson, 1989). A lead firm may play the role of coordinator within a "constellation" of firms, providing a link to sources of information, innovation and technology (Shepherd, 1991; Shaw, 1991).

Within the local network, "key individuals" are the most frequent initiators of local development initiatives in Europe once central state action began to wane (Stöhr, 1990b: 4). More importantly, the key individuals were often informal initiators, rather than entrenched government or business leaders, who brought through their personal networks new information and ideas. Working in North Carolina, Schell (1983, 1984), has found that community leadership--or the lack of it--has a large influence on local levels of new firm formation.

The development of nonmetropolitan areas within Italy can be seen as a result of these subjective factors: information and cooperation. The subjective factors are largely those related to "the presence of local entrepreneurship and to the local capability of shifting resources [including labor] from traditional to innovative uses" (Camagni and Capello, 1990: 329). Further work has shown that rural and urban areas afford different bases for entrepreneurial development (Westhead, 1990). The drawbacks for local innovation in backward regions, including most rural areas in most developed countries, have been noted for many years (Ewers and Wettmann, 1980). To a large extent, the level of innovativeness in peripheral areas depends on the degree to which firms are tied to local networks of suppliers and to external markets (Camagni and Capello, 1990; Turok and Richardson, 1991). Firms in such "constellations" are more able and willing to seek information from outside sources, such as consultants, universities, and other firms (Lorenzoni and Ornati, 1988).

Local purchasing is quite important. Small and locally owned firms, and particularly those which do some R&D, purchase larger proportions of their inputs from within the region where they are located (Hagey and Malecki, 1986; Kipnis and Swyngedouw, 1988). The most significant implication of this work is that local purchasing, especially when related to R&D, promotes innovative activity on the part of suppliers. This innovativeness is able to renew economic activity because new product cycles are initiated and shorter production volumes associated with niche markets are likely. As economies of scope and shorter product life cycles replace economies of scale as priorities of firms, such innovativeness is ever more crucial to corporate--and local--competitiveness (Scott, 1988a; Teece, 1980, 1986; Thorelli, 1986).

Interfirm interaction--via input-output linkages as well as information exchange--is largely a localized phenomenon, particularly for small firms. For small firms, the locality is much more integral to the entire essence of the enterprise (Illeris, 1992). Large firms are more likely to be oriented toward other sites within the corporation (or within a network of alliances) and to have extensive (nonlocal) contacts with other firms, large and small. Large firms develop a wide network of contacts and information sources on markets, suppliers, and technology. Because not even the largest firms have complete information, "strategic alliances" provide windows on information available to competitors (Chesnais, 1988; Cooke, 1988; Mowery, 1988). Partnerships or formalized linkages between large and small firms for a variety of purposes are also seen as an increasingly useful way for a firm to go beyond its own capabilities and information sources (Commission of the European Communities, 1989; Lawton Smith, Dickson, and Smith, 1991).

The decisive element in development--human interaction in social networks--has been neglected in most development research. Indeed, it is the interdependence of firms in social networks that stimulates their success and determines their fortunes--and ultimately that of their communities--and constantly generates and regenerates innovations and new economic activity (Doeringer, Terkla, and Topakian, 1987; Malecki, 1989). Despite some attention two decades ago (Thorngren, 1970), little research has been done on this "entrepreneurship as embedded in networks of continuing social relations" in the United States (Aldrich and Zimmer, 1986, Granovetter, 1985). Johannisson (1990), who has done extensive research in Scandinavia, and Sweeney (1987), summarizing diverse European experiences, also believe that human interaction is the key to economic vitality (Christensen et al., 1990).

Small firms are especially likely to become involved in informal arrangements with other small firms, as a natural consequence of familiarity among individuals. Large organizations are also dependent on networks of information, and to a large extent these determine the competitiveness of the enterprise. Håkansson (1989) has established that the most competitive Swedish firms--whether large or small--take advantage of networks of suppliers and customers in order to obtain information about new product and process ideas. Larger, more bureaucratic, organizations tend to engage in formal strategic alliances and subcontracting arrangements, in which legal stipulations substitute for trust.

Interfirm Interactions

An especially fruitful perspective from which to view the interdependence of firms is that of *networks*. In essence, this view suggests that social networks evolve into business-focused networks, whereby firm formation takes place, and then into strategic networks, which allow firms to innovate and to thrive by their links to other organizations (Butler and Hansen, 1991; Courlet

and Pecqueur, 1991; Dubini and Aldrich, 1991). Local networks provide an array of important entrepreneurial competencies: know-what, know-how, know-when, know-who, and know-why, all of which are critical to new firm success (Johannisson, 1991). The former employer of a new firm founder and other, even competing, firms may be included within the network of new, small manufacturers (Young and Francis, 1989). These network forms of organization involve complex webs of interconnections among suppliers, customers, and individuals in the various organizations (Antonelli, 1988; Bristor and Ryan, 1989; Powell, 1987; Thorelli, 1986). A major portion of the success of Japanese firms, corporate families or *keiretsu*, have received attention recently, because they appear to be the best developed with respect to interorganizational linkages (Aoki, 1990; Sakai, 1990; van Kooij, 1990, 1991). Partnerships among large and small firms, characteristic of Japanese industry, include interaction by itinerant engineers of large manufacturers who spend most of their time visiting subcontractors, either to help set up a line for a new model of product or to help solve quality problems (Sako, 1989). Such interaction also is a central characteristic in the recurring innovativeness of the Silicon Valley region (Saxenian, 1990, 1991).

Cross-national studies of learning about technologies clearly show that information within and among firms flows mainly through informal channels--that is, through interpersonal contacts (Allen, Hyman, and Pinckney, 1983; Håkansson, 1987, 1989; MacPherson, 1991b; Meyers and Wilemon, 1989). Contacts between producers and users of their products and services also become important sources of innovation (von Hippel, 1988). If firms are in close and frequent communication, the risk of an innovation failing to meet a customer's needs are minimized (Rothwell, 1991). While some of this interaction must be done face-to-face, much (if not most) can be accomplished via telecommunications technology, including telephone, fax, and modem.

The network focus in local development suggests policies that are quite different from those which focus on the objective conditions or variables in the local or regional environment (Malecki, 1992). If left on their own, informal networks may well remain sparse and exclude most entrepreneurs. A government policy to encourage the development of networks, by sponsoring local events which bring small businesspeople together, can for a small cost have a large impact (Britton, 1989a; Sweeney, 1987). The informal contacts initiated at such gatherings can evolve into sources of information, advice, and finance that are critical to new firm formation (Birley, 1985; Miller and Coté, 1987). A government gatekeeper has to have contacts and credibility in both business and government circles, so the ideal individual is difficult to identify (Bianchi, 1990; Mokry, 1988; Shapira, 1990; Sweeney, 1987).

Government policies can facilitate the growth of small firms. Most public-private partnerships, while to some degree building and reinforcing the social networks of community leaders and actors, focus on formal institutions rather than interpersonal contact. Policies that can "improve the external economies of the local system, strengthening the network among local firms" will be specific to each *milieu* and encourage informal, unplanned interaction (Garofoli, 1990: 430). In most countries, the information needs of small firms have long been neglected (Britton, 1989b; Shapira, 1990). In most areas, there is a severe shortage of business services, external information, and business advice, for which an intermediary role is also recommended (Hull, 1990; Utterback et al., 1988). Interaction between public and private sector in a locale, indeed, appears to be of considerable importance in creating and maintaining contacts, and in creating a supportive milieu for new firms (Donckels, 1989; Fosler, 1988; Miller and Coté, 1987).

The provision of intermediaries or liaisons who are technically proficient can greatly raise the level of knowledge in a region (Bianchi and Bellini, 1991; Britton, 1989a; Sweeney, 1987: 239-262). Government involvement in networks, however, must avoid the inclination to become centralized and bureaucratic (Sweeney, 1990). Links to central government research institutions and central agencies, rather than local ones, do little to improve local networks. The Japanese *Kohsetsushi* centers, located in every prefecture throughout Japan, are models for upgrading the technology of small and medium-size firms. The centers work in sectors and applications of interest to local firms, and operate in the middle of the technology stream--that is, not on the leading edge, but ahead of the bulk of their small-firm clients (Shapira, 1991).

Flexibility

Market niches remain the key for "the factory of the future," and "mass customization" requires that market information and production be well coordinated (Goldhar, 1986; Pine, 1992). In order to address the decline in mass markets, more flexible forms of production, of interfirm relations, and of work are presently forcing changes into the orderly sequence suggested by the product cycle (Ayres and Steger, 1985; Goldhar, 1986). Flexibility has become part of the prevailing perception about current economic change, especially within firms and regions. It is useful to distinguish among these three types of flexibility, for they represent truly different forms of organizing production, directed toward the twin goals of product innovation and quality:

> (1) the adoption of systemic computer-integrated manufacturing technologies,
> (2) the development of new, systematic relationships between plants and firms, and
> (3) the adoption of a new, flexible labor process in which the past tendencies towards the increasing division of tasks, the deskilling of work and the removal of control over production from the worker are reversed (Hoffman and Kaplinsky, 1988: 331).

Flexibility in Production

Production flexibility includes the spectrum of changes which result from automation. Automation based on computers and microelectronics has three qualities which push it beyond the concept of other labor-saving capital investment. First, flexibility is built into the machinery, which is general-purpose rather than product-specific. No setup is required to switch to a different product; a new product can be built simply by programmed instructions on machines which can produce many different products (Shaiken, 1984: 6-7). Second, this flexibility leads to a broader scope of application. The expense of new technology might be greater than of previous generations of machines, but it provides a great deal more flexibility (to use the word in yet another sense) in product variety. This form of flexibility is especially important, because a firm with such a capability is able to handle both routine, volume production and more difficult (and profitable) nonstandard orders, which allow it to take the lead on small-volume, new product introduction (Hayes and Wheelwright, 1984: 40). Dramatic changes in market demand over the past 20 years have rendered mass production a smaller-volume proposition, and shifting concern to any ever-greater array of products manufactured for different market segments. That this is occurring is vividly shown in the case of General Motors Corporation. "In the early 1970's, GM shipped one million Chevrolet Caprices annually. Today, such best-sellers as the Corsica and Beretta manage annual sales of only 350,000 or so between them, and automakers must cater to

regional preferences" (Taylor, 1989: 104). Consequently, GM and scores of other firms have been forced to alter their approach to production. Finally, an important goal in itself of programmable technology is improved quality and reliability, a factor more important than variety or price in many markets (Sciberras, 1986; Starr and Biloski, 1985).

Economies of scope help to explain both the push toward flexible production within firms and the profusion of strategic alliances among firms (Charles, Monk, and Sciberras, 1989; Teece, 1980). Internal economies of scope accrue to firms which can produce two or more different, related products together more cheaply than in isolation, ideal for situations of product differentiation. External economies of scope result when firms can use their know-how to apply to the activities--particularly innovative activities--of other firms and other markets.

Within firms, the Fordist priority on mass production based on economies of scale has given way to economies of scope, cost savings based on producing a variety of products or services in small--even one-of-a-kind--batches. Ideally, such a factory "can produce a continuous stream of different product designs at the same cost as an equal stream of identical products" (Goldhar, 1986: 27). In order to retain some efficiencies, "design for manufacture" simplifies (in order to keep production volumes high) products to minimize the number of parts and to increase the number of common parts in different final products (Charles, Monk, and Sciberras, 1989: 135-137). As Hitomi (1989) summarizes, such multiproduct, small-size production is characterized by the following:

(1) a variety of product items,
(2) produced in different volumes,
(3) with different due dates,
(4) a variety of production processes,
(5) complexity of productive capacity,
(6) uncertainty of outside conditions,
(7) difficulty of production planning and scheduling, and
(8) a dynamic situation of implementation and control of production.

Automation has different effects depending on where and how it is applied. Automation may take place only within a specific activity ("island automation"), such as an individual manufacturing step, like the sewing of buttonholes, or within computerized design, and not affect the others. A higher level of automation involves the integration of activities within a given sphere of production (for example, design or manufacture) but where each sphere is still unconnected to the others (Kaplinsky, 1984a). This level of automation, a flexible manufacturing system (FMS), may include up to several machining centers and/or robots, and permits the small-batch and custom production needed for economies of scope and product variety. A British Aerospace FMS, for example, produces 2,000 variants of small aircraft parts by batches of 5 to 10 units each (Tchijov and Sheinin, 1989). FMS is most commonly found in aerospace and in machinery and automotive engine production, where lot sizes are small and demands for performance are high (Warndorf and Merchant, 1986).

The ultimate level of automation is the integration of design, manufacture, and coordination into an integrated unit, labeled computer-integrated manufacturing (CIM) (Goldhar, 1986) or "systemofacture" (Hoffman and Kaplinsky, 1988). Most automation falls short of CIM and instead is largely confined to uncoordinated "islands of automation" (Bessant and Haywood, 1988; Kaplinsky 1984a). CIM is still a goal toward which companies, especially the largest ones, are

aiming (Edquist and Jacobsson, 1988; Flynn and Cole, 1988; Goldhar, 1986; Hoffman and Kaplinsky, 1988: 146-152). As "the benefits of flexible manufacturing are becoming available in different forms to suit different product/market characteristics," the beneficiaries may have begun to include smaller firms (Bessant and Haywood, 1988: 354). However, the automation technologies and their organizational counterparts are easily misunderstood and misused, and are particular obstacles for small firms (Cainarca, Colombo, and Mariotti 1989; Gros-Pietro and Rolfo, 1989; Warner, 1987). "Flexibility is much more an organizational property than a technical one" and is best managed by large firms (Bessant and Haywood, 1988: 359).

Flexibility in Interfirm Relations

Such production systems require, in turn, a tightly controlled stream of inputs tailored to the needs of production on both a short-term and a long-term basis. On a daily scale, supplies of inputs are best managed at low cost by employing the just-in-time (JIT) system of inventory management, developed by Toyota during the 1950's. "In broad terms, the core of the JIT concept is the elimination of waste in all forms--production, materials, labor, time, energy, money and so on" (Arnold and Bernard, 1989: 403; Lenz, 1989). Variations of JIT are being adopted in many sectors, with implications for manufacturing in urban and rural areas alike. Instead of the producer (for example, an automobile assembler) maintaining inventories of all the many hundreds of parts needed for the vehicles to be produced, parts suppliers are required to deliver these several times per week--or per day. This sort of system thus demands that suppliers provide a higher level of quality: fewer defective parts per order with a goal of zero defects. In short, parts producers must operate at a higher frequency ("more often") and in smaller volumes ("less") than was true under traditional production organization (Arnold and Bernard, 1989: 415; Hoffman and Kaplinsky, 1988; Lenz, 1989).

The reduction in throughput time, or cycle time, becomes a source of profitability (Schmenner, 1988). Focusing on reduction of throughput time results in reduction of inventories, setup time, and lot sizes. These changes, in turn, induce improved quality, revamped factory layout, stabilized production schedules, and minimization of engineering changes. Thus, there are intangible gains from automation which conventional productivity measurements do not take into account. *Time* has become "a manufacturer's most precious commodity" (Port, King, and Hampton, 1988: 104; Schmenner, 1988; Stalk and Hout, 1990).

JIT production spills over into many other activities of production, and this favors its adoption by large--rather than small--firms. It permits or necessitates, for example, integrated data processing for R&D, procurement, production planning, inventory control, and marketing (Arnold and Bernard, 1989). This is illustrated in the systems established by major U.S. retailers, which feed daily sales data to computers at several clothing manufacturers, itemizing the styles, colors, and sizes which must be stocked (Caminiti, 1989). Finding customers for the more diverse array of new products makes sales and marketing more important company functions (Starr and Biloski, 1985; Teece, 1982). Consequently, flexible technologies appear to promote larger, rather than smaller, firm sizes. Alternatively, they necessitate a well-tuned network to coordinate a large and diverse set of suppliers and markets.

The number of suppliers tends to drop substantially under JIT, also promoting larger firm size, since a proliferation of input producers is unwieldy to manage, and single-sourcing becomes commonplace. Suppliers may face increased costs--among them for computer systems and

communication links--largely related to a push for high quality, "zero defects" production (Arnold and Bernard, 1989). The communications needs of flexible production can be very large and costly, but the use of information technology is a prominent aspect of both industrial districts and of large corporate organizations (Rullani and Zanfei, 1988). The JIT system leads into requiring greater R&D and manufacturing system improvements at the factories of suppliers. R&D for automobile component firms has grown steadily, as electronics, new materials, and other new technologies have become standard practice (Hoffman and Kaplinsky, 1988: 158-169). This reliance on suppliers has the significant effect of reducing the number of suppliers to those few which are reliable in terms of quality, delivery, and response.

The Example of Clothing

The apparel or clothing industry is one which benefits greatly from faster turnaround in production. For many years now, garment producers have relied on low-wage labor, primarily in Asia, to produce standard, low-cost clothing for industrialized markets in North America and Europe. As a set of standardized products which have large-volume sales through mass merchandisers and chain department stores, clothing manufacture (particularly assembly and sewing, often of pre-cut fabric components) was especially well suited to low-wage locations, such as parts of rural America as well as Asia and countries of the Caribbean. In fact, textile and clothing production were the principal examples of the "new international division of labor" which rose to prominence in the 1970's (Fröbel, Heinrichs, and Kreye, 1980).

More recently, however, the clothing industry, like that of automobiles, has become more concerned with fashion, lead times, and inventories. Increasingly, however, lead times--orders must be placed with subcontractors months in advance--and speed of delivery are important, allowing retailers to charge prices that remain stable without markdowns or discounts for fashionable goods. This trade-off between speed and low costs has long been present in clothing production, but its significance has grown along with the importance of frequent style changes. Domestic manufacturers that have electronic data processing links to major retailers can fill orders in as little as two days, and generally in less than a month for any item, compared to three to four months from plants in the Caribbean (for the U.S. market) and longer from Asia, which is the major supply region for both the United States and Western Europe. Thus, the return of clothing production to the United States is similar to the reagglomeration situation of other industries that have adopted flexible and computerized manufacturing (Gibbs, 1987, 1988; Weiner, Foust, and Yang, 1988).

Technological change is more difficult to effect in clothing than in the related textiles industry, largely because of the complexity of sizes, fabrics, and styles on ever-smaller production volumes (Hoffman and Rush, 1988). Where it is being put into place, and even where it is not, low-wage countries are somewhat less attractive locations than previously. Pre-assembly tasks, such as marking and cutting, are those being automated most, shortening the time required from design to assembly. Being able to reduce the lead time provides both a jump on competitors and profitability, which innovation and fashion traditionally have provided. Innovations in sewing have been common, primarily, only among the largest firms, and along with the pressure to shorter lead times, promise to make even clothing production, long a low-tech entry point for low-wage countries, an industry increasingly found in developed countries and wealthy newly industrialized countries (NIC's) (Hoffman and Rush, 1988).

Robots and Flexible Production

One way in which firms have changed is to adopt automated production equipment, especially robots. To a large degree, unionized workers are perceived as unwilling to submit to technological change, because their jobs are indeed threatened (Ayres and Miller, 1982; Bamber, 1988). Craftsmen and other skilled workers, especially those which use precision industrial machinery in machine shops and factories, are among those most threatened by automation technologies (Blackburn, Coombs, and Green, 1985; Harrison, 1984; Shaiken, 1984). In the clothing industry, small firms are increasingly seen as out of the market for CAD-based systems (Hoffman and Rush, 1988).

Robots are the principal new technology of flexible production. They can be programmed--and in most cases reprogrammed--and require dramatically less labor than do the labor-intensive production operations which they replace. While jobs are replaced by robotics, they tend to be unskilled, repetitious jobs; any new jobs created by adoption of robots demand a significant technical background (Edquist and Jacobsson, 1988; Salih, Young, and Rasiah, 1988). A British study of employment changes in various occupational categories from 1978 to 1984 showed that only professional scientists, engineers, and technologists were increasing, while all others, including managerial, administrative, and clerical staff, draftsmen, and technical staff, declined (Bessant and Senker, 1987). Multinational corporations "will continue to seek cheap labour, the only difference is that the labour they now want has to be skilled" (Salih, Young, and Rasiah, 1988: 396).

Despite their advantages, the adoption of robots has been slow, except in Japan and Sweden. Robotization has been greatest in the automotive and electrical/electronics industries, which together account for over 50 percent of applications in most countries (Tani, 1989). Japanese adoption of robots is also striking in their wider adoption within firms. It is not so much that there are more Japanese robot users, but that adopting firms have many more of them (Mansfield, 1989). The same was true of the previous generation of production technology (Hicks, 1986). The diverse demand in Japan for new computerized equipment, in turn, stimulated development for specific small markets of machinery firms (Friedman, 1988: 211-217). Small producers were able to utilize best-practice flexible machinery and to become internationally competitive. By contrast, the American lag in adopting robotics and other new flexible production technology is a result of adherence to traditional, short-term financial analysis which thwarted experimentation with new technology (Dean, 1987; Hayes, Wheelwright, and Clark, 1988; Mansfield, 1989).

Edquist and Jacobsson (1988) suggest that three factors influence the diffusion of new technologies in the NIC's: information, especially from suppliers, education and training, and labor costs. The findings on the adoption of new production technologies in the United Kingdom and the United States suggests that traditional core-region locations with skilled labor and company R&D activities will be favored (Hicks, 1986; Oakey, Thwaites, and Nash, 1982; Rees, Briggs, and Oakey, 1986). The adoption of robots is no guarantee of competitiveness and profitability for firms. Much depends on how these are used within a production system (Krafcik, 1988). For example, in a comparison of Japanese and U.S. factories where FMS was utilized, Japanese firms used them to produce nearly ten times the number of different products. For American workers, the telling point seems to be that the U.S. firms had opted for a larger-scale, lower-scale cost/variety production (Jaikumar, 1986).

Automation technologies, market orientation, and shorter production runs push assembly activities back to industrialized countries, breaking down the international division of labor (Kaplinsky, 1984b; Sayer, 1986; Sanderson et al., 1987; Schoenberger, 1988). Within developed economies, the decentralization of industry to rural areas and to foreign sites common in the 1970's is no longer the norm. Production is being pulled back to the central plants where R&D and engineering and interaction with suppliers and customers can best be accomplished (Camagni, 1988; Schoenberger, 1987). Plants which adopt new production technologies do so at significantly higher rates in traditional core-region locations (Rees, Briggs, and Oakey, 1986).

Networks of suppliers on the Japanese model are also part of the restructured geography of production systems. In the auto industry, it is noteworthy that these have retained a bias toward traditional auto manufacturing regions, because of the skill requirements needed to maintain quality in both components and in the final product. Some Japanese firms themselves have combined a requirement that suppliers be located relatively nearby for JIT to succeed. At the same time, several auto firms and their "transplant" suppliers--Japanese auto parts firms which have located factories in the United States--appear to have chosen their locations in small towns to avoid as much as possible labor union organization, a strategy employed by General Motors as well (Kenney and Florida, 1988; Mair, Florida, and Kenney, 1988). In other words, the dispersion of auto production which has been observed (Glasmeier and McCluskey, 1987) may be little more than a "local-scale dispersal" that retains proximity to the core region of North American auto production but on greenfield sites (Mair, Florida, and Kenney, 1988: 370; Schoenberger, 1987). One should note that a sizable proportion of components are still imported from the Far East and Japan into the United States, the United Kingdom, and elsewhere in Western Europe.

In other industries as well, flexible systems have reduced the appeal of low-wage labor pools in favor of concentrations of different functions which contribute to production (Schoenberger, 1987). Geographically, the impact of this form of technological and organizational change is to make industry concentrate in areas where specialized firms and skilled labor are abundant, and where unforeseen changes could also be accommodated.

Flexible Labor

The presence of fewer routine tasks and few long production runs from flexible production leads to a demand for a "highly skilled, flexible, coordinated, and committed work force" (Walton and Susman, 1987). Whether this is "neo-Fordism" depends on the degree to which new forms of work organization are employed. Neo-Fordism within the workplace involves the integration of different productive sub-units into a larger "flexible manufacturing system" for the production of a variety of products. This requires that workers themselves be "flexible" rather than rigid in the definition of the tasks for which they can be called upon (Blackburn, Coombs, and Green, 1985). The task fragmentation, functional specialization, mechanization, and assembly-line principles of Fordism are replaced with a social organization of production based on work teams, job rotation, learning by doing, flexible production, and integrated production complexes (Kenney and Florida, 1988). These are largely work practices that evolved in Japan and which involve large firms. In a variety of respects, the "Japanese model" of production stands in sharp contrast to the Fordist model, but it also involves a blend of large, powerful companies and use of tight relations with supplier firms and teamwork in production (Hiraoka, 1989; Junkerman, 1987). This teamwork, usually embodied in "quality circles," is among the most frequent aspects of the "Japanization" of industry (Littler, 1988). Gertler (1988: 426) points out that the greater skills demanded of labor

in such flexible production systems results in greater reliance on, and less flexible relationships with labor.

Such changes are taking place outside manufacturing as well. The proliferation of computer technology and word-processing capability in office work has had several layers of effects. First, it has eliminated the prospect of employment for those whose entry-level skills do not include familiarity with computers, or sufficient literacy to solve nonroutine problems. The computer skills needed for "back-office" activities of banks, insurance companies, data processing firms and others are not great, and many of these activities have gone to distant locations. For example, Citicorp established a credit-card processing center in Sioux Falls, SD, over 1,000 miles from the firm's New York headquarters. Most back-office activities, which formerly were literally in a back office of the headquarters of such firms, have simply suburbanized. In large part, suburban locations are where the demand for high-quality, "cheap but educated" clerical labor is best met. Relatively high levels of education, language and communication skills, and middle-class manners and social values are prized for the more demanding nature of clerical work (Nelson, 1986). For these reasons, members of minority groups and others whose education-related skills do not meet the criteria are increasingly out of the running for such jobs (Cyert and Mowery, 1987; Stanback, 1987).

A second effect of the proliferation of computer technology has been demand for more flexibility on the part of workers. In addition to qualitative flexibility demanded by automated production, firms also make use of numerical labor flexibility through the use of contingent workers, or workers hired at less than the standard wage, for less than the standard workweek or workyear, or with less than standard fringe benefits (Belous, 1989). This group is particularly common in the service sector, where part-time work is more common, among "homeworkers" and, increasingly, in manufacturing among subcontractors (Christopherson, 1989; Pollock and Bernstein, 1986). Indeed, the percentage of workers who work neither full-time nor year-round is nearly 45 percent in the United States, and 65 percent in service industries, facts which are masked by statistics on "employment" and "unemployment" (Belous, 1989; Christopherson, 1989). Part-time employment, a growing portion of employment in all developed countries, is overwhelmingly (over 60 percent) female (Belous, 1989: 50-52).

Amin (1989) notes that this type of flexible labor force has been a major part of the success of the "Third Italy" and some other new "flexible regions." Flexibility may refer mainly to "an ability simply to survive, and on the basis of an artisanal capacity to respond to new designs and new market signals, as well as other factors such as self-exploitation and the use of family labor, the evasion of tax and social security contributions, low overhead costs, and the use of cheap female and young workers, especially in the area of unskilled work" (Amin, 1989: 30).

At the opposite extreme, labor skills and flexibility are demanded. Small-volume batch production systems require less labor than do massive mass-production facilities, but workers must be sufficiently educated and skilled to perform their jobs on an ever-changing mix of products. The transfer of Japanese labor practices to North America and Europe has not been smooth, in no small part because of cultural factors and varying histories of industrialization (Hoffman and Kaplinsky, 1988: 337-341; Holmes, 1987; Wood, 1988).

Flexible production and the prominent place of small firms forces labor training to the forefront of local policy (Lloyd, 1989). Flexible firms need skilled and flexible workers. This need not

mean exploitation of labor; rather, it implies the flexibility of nonroutine work associated with innovation, niche markets, and economies of scope (Doeringer, Terkla, and Topakian, 1987). While large-scale projections of increased skill requirements are easily made, regional and local variations are prominent, suggesting that training and education policies must be locally based (Spenner, 1988).

Technological change raises the required level of theoretical knowledge necessary to perform a job. High-technology industries, in particular, demand understanding of complex capital equipment, technical documentation, and integration of complex technologies (Bartel and Lichtenberg, 1987). The need for worker skills varies over the life cycle of a product (Carnevale, Gainer, and Meltzer, 1988; Flynn, 1988).

Carnevale, Gainer, and Meltzer (1988) suggest a hierarchy of basic workplace skills, which go beyond academic skills of reading, writing, and arithmetic (the three R's):

(1) knowing how to learn;
(2) competence in reading, writing, and computation;
(3) oral communication and listening;
(4) adaptability: creative thinking and problem-solving;
(5) personal management: self-esteem, motivation and goal-setting, and personal and career development;
(6) group effectiveness: interpersonal skills, negotiation, and teamwork; and
(7) influence: organizational effectiveness and leadership.

These "workplace basics" are likely to be personal, but they also are broadly cultural, and will vary according to the demands of local employers. The fullest range of skills will be found in nonroutine jobs, but a number of these basic skills are required by routine work as well. A machinist, for instance, must have technical reading skills in order to interpret blueprints and use precision instruments. He or she must be able to compute, for example, from fractions to decimals. In addition, problem-solving is needed to select the appropriate tools and machines for a particular task, and to tinker with and make adaptations for custom jobs (Carnevale, Gainer, and Meltzer, 1988: 22; Doeringer, Terkla, and Topakian, 1987: 88). In a setting where custom products and short product life cycles are the norm, many work tasks are nonroutine, and thus depend on the largely personal and interpersonal skills and adaptability.

Skill demands are rising in services as well as manufacturing. In the financial service sector, four kinds of skills are seen to be needed, which apply to manufacturing workers as well:

(1) social, for effective interpersonal communication;
(2) product-knowledge, for effective marketing and selling of services;
(3) keyboard and diagnostic, for interface with systems and resolution of problems that arise; and
(4) entrepreneurial, for ensuring the viability of individual cost or profit centers in an organization (Rajan, 1987: 225).

The decline in the demand for unskilled, usually manual, workers has been seen as a result of technological change in all countries (Johnston and Packer, 1987). In essence, entry-level skills are rising most rapidly, a fact which hits hardest disadvantaged and minority populations (Cyert

and Mowery, 1987). An illustration of the changing skill mix found in the labor market is seen in the projections for the year 2000 in the United States by the Hudson Institute. Low-skilled jobs, such as laborers, are expected to decrease more than 50 percent. The most skilled sets of jobs, on the other hand, are expected to double as a percentage of the total (Johnston and Packer, 1987: 98-101). These skill ratings reflect a composite of language, math, and reasoning skills. To reinforce the point above concerning entry-level skills, Johnston and Packer (1987: 100) state that "jobs that are currently in the middle of the skill distribution will be the least-skilled occupations of the future, and there will be very few net new jobs for the unskilled." For those who do not have basic skills, the growing demand for multiple, or polyvalent, skills is even more difficult.

Education and training programs are the primary systems by which the human capital of a nation is preserved and increased (Johnston and Packer, 1987: 116; Porter, 1990). Post-secondary, non-university training is especially weak in laissez-faire nations, such as the United States. "Private firms underinvest in training because such investments can relatively easily be lost. In contrast to investments in capital goods, which can be bolted down, a worker can take his or her expensive training to another firm" (Spring, 1989: v). In addition, small firms, which "need people with a specific skill in twos and threes," are unable to justify full-pledged training programs. The shift from large to small firms, increased subcontracting, and other dimensions of flexibility also mean that education and training in transferable skills, rather than employer-specific training, become more important (Seninger, 1989). Small firms are those most plagued by a general problem of inadequate expertise and skills at several levels--managerial, supervisory, and production employees. "Small firm workforces are top to bottom under-educated, under-trained, and under-skilled" (O'Farrell and Hitchens, 1988: 414).

An improved training system would involve several parts. First, vocational education can provide meaningful training to students who are provided work in private firms. For students not going on to a university, firms may pay most of the cost of an apprenticeship, as is done in Germany (Osterman, 1988: 110-132; Spring, 1989: vii). American training systems fall short of those in Europe, notably Germany and Sweden, where the latter involve joint industry-labor-government coordination. The U.S. penchant for free market solutions makes such coordination voluntary rather than systematized (Spring, 1989).

> The pace of technological change, however, means that Schools cannot hope to prepare workers for emerging skill needs as they initially arise. As skill-training life cycles evolve, however, and skills become more generalized and transferable among employers, schools can provide such training (Flynn, 1988: 149-150).

This skill-transfer process requires close collaboration between employers and educational and training institutions for identifying skill needs and standardizing training programs in those skills. These skill needs are local because labor markets are locally unique, comprised of local workers, workplaces, and local histories (Flynn, 1988).

Industrial Districts: Rural Potential

Industrial districts embody the interaction and dense network of linkages that comprise a local production system, usually around a single or highly related industries. Indeed, the industrial district itself can be seen as a *collective entrepreneur*, with not only firms, but interfirm

associations, worker organizations, financial institutions, and governmental agencies also playing important roles (Best, 1990). Italian industrial districts, while not a recent phenomenon, received attention in the English-speaking literature primarily through Piore and Sabel's work in the early 1980's (Piore and Sabel, 1983; Sabel, 1982; Piore and Sabel, 1984). (Useful reviews of the European literature are found in Garofoli, 1990; and Maillat, 1990a,b; see also Goodman, Bamford, and Saynor, 1989; and Pyke, Becattini, and Sengenberger, 1990.) Subsequently, the industrial district has received increasing attention as a small firm-based alternative to large corporations in older industrial areas (Rosenfeld, 1989-90; Sabel, 1982, 1989). Not all spatial agglomerations of small firms in the same or related sectors necessarily comprise an industrial district or local industrial system. A functioning *network* or *filière* of firms is an essential phenomenon for local development (Bull, Pitt, and Szarka, 1991).

Industrial districts are a specific type of agglomeration, characterized by "a 'thickening' of industrial and social interdependencies in a certain place" (Becattini, 1990: 161; Becattini, 1989: 132). These districts are primarily comprised of small firms whose markets are national or international, rather than local (Brusco, 1986). Interfirm relations--among the small firms themselves and with outside customers, agents, and competitors--stimulate innovations that often are best-practice technology (Rullani and Zanfei, 1988). Similar districts elsewhere in Europe suggest the generality of the industrial district (Friedman, 1988; Hansen, 1990; Lewis and Williams, 1987; Lorenz, 1989; Maillat, 1990a; Rosenfeld, 1989-90; Sabel, 1989; Sabel et al., 1987). The web of local information flow, linkages, subcontracting, and sharing of new equipment--often eased by family ties--is the heart of the agglomeration advantages of industrial districts (Friedman, 1988: 196-198). Innovation can result from the specialization of interdependent firms in a district, as entrepreneurs start up new businesses making a variation on the original product (Capecchi, 1989; Russo, 1985). Innovative entrepreneurship is highest where there is an accumulated managerial, technical, and commercial competence which is shared within the local milieu (Brusco, 1986).

Cooperation permits the development of regional innovation complexes which can thrive in peripheral regions and do not require agglomeration economies of the sort found in large urban regions (Scott, 1988b; Stöhr, 1986). Within industrial districts, *cooperation* among firms is the key element (McArthur, 1989: 203-204; Stöhr, 1986). Based on work in Denmark, Hansen (1991) and Kristensen (1989) suggest that small-scale, specialized firms and a culture which supports entrepreneurship and cooperation are new or different development models from the urban-based industrial archetype. Training and apprenticeships, artisan networks, and cooperatives are common, especially in Jutland, far removed from metropolitan Copenhagen. Haughton (1992) describes similar cooperation and sharing in the Australian wine industry. Other observers, however, do not seem to agree with this optimistic assessment of rural areas. Bramanti and Senn (1990) see nonmetropolitan environments as simply less supportive of firms' efforts at product innovation. The labor and knowledge inputs necessary are in short supply.

The industrial district, in low- as well as high-tech settings, and the ability of some districts to be extremely competitive internationally, suggests that it may be a viable model for regional and local development (Rosenfeld, 1989-90). At the same time, the preindustrial character of Italian, Japanese, and perhaps other industrial districts also incorporates captive labor markets where economic vitality is a relatively recent phenomenon. The extent to which these districts ought to serve as models for other places and cultures deserves more serious examination (Blim, 1990; Sakai, 1990). More importantly, the integration of local economies in the global economy may be

far more significant than the means by which localities appear to be self-contained and decentralized (Amin and Robins, 1990).

Flexibility appears to reinforce agglomeration economies and cumulative causation processes to a degree unanticipated (Piore and Sabel, 1984). This suggests that the networks of small firms--even without large-firm control--are sufficient to compete against large firms. Artisan networks in Emilia-Romagna and other provinces of the "Third Italy," in industries as diverse as knitwear, gloves, shoes, and ceramic tile, began to make impressive showings in world markets. The competitiveness of these industrial districts lies in their flexibility--first, in terms of labor, since they rely largely on family members rather than employees, and second, in terms of innovativeness based on artisanal skills (Brusco, 1986; Piore and Sabel, 1984: 213-216, 226-229; Russo, 1985). Each of these industries was poised to take advantage of the shift to fashion, unlike mass production.

The larger question that remains unresolved at this time is the degree to which flexible accumulation will be the province of small- and medium-size firms, building wider forms of common services inspired to a large degree by large-firm models, in contrast to the web of subcontractors amassed by large firms as they attempt to replicate the advantages of industrial districts (Sabel, 1989: 18-19).

The Prospects for Rural Areas in North America

Rural areas and their manufacturers are not excluded from competitiveness in the 21st century, but neither is their future secure. More than in the past, we recognize the existence of local variations, especially in what may be termed the "technical culture" of places. To some degree, these depend on past experience, but they also depend on technologically oriented education and training, which are a primary means by which such a culture is passed on to others. Rural firms can form networks and share in economies of information, but not without effort (Sweeney, 1991). Fewer competitors and fewer similar firms make such networking difficult (Pettitt and Thompstone, 1990). Management skills, in particular, are likely to be weak in the absence of stimulation by new ideas and information.

What does flexible manufacturing mean for rural producers in the United States and Canada? The North American Free Trade Agreement may well mean that low-wage industries will gravitate toward the Mexican labor force. Thus, the skills of workers as well as the management capability of managers will be needed to operate in the low-volume, quality-conscious, market-oriented environment of niche production. Rural areas are certainly capable of hosting small-batch production of the sort encompassed by the "flexibility" paradigm. Indeed, Reich (1988) suggests that only four barriers need to be addressed by policies: transportation, communications, technological extension, and training.

Research on high-tech firms in rural areas confirms that these operations tend to be at the mature end of the product cycle and to bear little resemblance to (or hope for) the dynamism associated with Silicon Valley and other innovative milieux (Barkley, 1988; Glasmeier, 1991). Indeed, the most suitable manufacturing activities for nonmetro areas would seem to be in "low-tech" sectors where the compatible skills and knowledge are readily available. "New economy jobs are mostly urban," Swaim and Teixeira (1991: 143) tell us. Concurring, McGranahan and Ghelfi

(1991) document that there was also a deterioration of the rural economic niche, as production jobs began to become more complex and demand more highly educated workers. Carnevale, Gainer, and Meltzer (1988), Cyert and Mowery (1987), and Reich (1991) provide evidence of this general demand for greater skills. The geographical impact has been that, during the 1980's, "while metro areas lost low-education jobs and gained high-education jobs, nonmetro areas gained only in low-education jobs" (McGranahan and Ghelfi, 1991: 51). As outmigration to cities, especially by the most educated and most qualified, continues, "for years to come, the rural labor force will be dominated by older workers who left school in earlier years" (Swaim and Teixeira, 1991: 145). In large part, the "quick fix" solution of enhancing education is unlikely to bring prosperity to rural areas (Killian and Parker, 1991). However, recall that education and training broadened the individual's network of contacts and information sources utilized for new product ideas, so it is not simply a neutral phenomenon (Horvers and Wever, 1989; Miller, Brown, and Centner, 1987).

Finally, some brief findings from a study of 33 firms in the Gainesville, Florida area, which probed by means of lengthy interviews the degree of innovativeness and the sources of innovation and information used by the firms. In general, firms with a larger number of sources of information about markets, about competitors, and about new techniques were those which had introduced a greater number of new products or services. These sources could be mainly within the local base of firms, or they could be with an external network. (One firm was in daily communication with clients in California.) For all small firms that took competitiveness seriously, regular attendance at conferences and trade shows was a "must." No other single activity or information source was able to provide the diversity of contacts and types of information.

Pending further, detailed analysis, we conclude that the network of the businessperson is critical to the firm's success, as recent research leads us to expect. An information network, whether local or nonlocal in scale, is critical. Outward-looking firms were overall more forward-looking as well, planning for new products, new techniques, new markets. The shortcomings of the Gainesville area--little manufacturing base, few suppliers, dominance of the local economy by the University of Florida--were emphasized only by those firms which, we might say, expected the network to come to them. Firms throughout the rural areas and small towns and cities of North America are much the same, we could expect. Success is found by those who seek it.

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Implementing the New Technologies: Problems in Peripheral Manufacturing

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Introduction

In recent years, economic geographers and other social scientists have been engaged in a vigorous debate concerning the nature of change in contemporary capitalist production systems, consumption patterns, and institutions (Harvey, 1989; Sayer, 1989; Schoenberger, 1988; Webber, 1991). A central theme in this debate is the question of whether or not we are entering a new era characterized by more flexible machines, employment relations, relations between firms, products, and markets (Florida, 1991; Wells and Cooke, 1991).

My own participation in this debate (Gertler, 1988, 1989, 1992) has been motivated by the observation that many firms, particularly those in mature industrial regions in countries like the United States, Canada, and the United Kingdom, are having major difficulties adopting and implementing these new flexible machines, production processes, supplier relations, employment relations, and so on. These experiences appear to contrast sharply with the apparently more successful regional models in countries like Japan, Italy, and Germany, where many producers seem to have perfected such methods, contributing in no small fashion to their competitive success at home and abroad (Piore and Sabel, 1984; Scott, 1988a, 1988b; Storper and Walker, 1989; Florida and Kenney, 1990). This divergence of experiences has forced scholars to consider many questions, among them: are these regions in Japan, Germany, Italy, and elsewhere simply aberrations--interesting exceptions--or do practices there represent the coming wave of economic organization in all types of industrial regions? Further, what is it about these particular places and the economic actors there that predisposes them to such success?

While the ensuing debate has not resolved many of these issues, it has served to underscore the important idea that "social context" seems to be crucial in influencing outcomes flowing from the application of new technologies and ways of organizing work. Furthermore, there is some suggestion that there are important and systematic spatial variations to this context--at the scale of locality, region, and nation. This paper seeks to understand and explain why manufacturing firms in what are increasingly becoming peripheral industrial regions have been experiencing serious problems as they try to translate the rhetoric of flexible production into industrial reality. The approach rests on developing some theoretical ideas that have emerged recently within and (especially) outside industrial geography, to explain the ways in which spatial context can influence the experiences of individual would-be adopters of the new technologies. After critically assessing this literature and synthesizing its most salient contributions to this question, I conclude with a discussion of implications for some mainstream economic and geographical theories, for industrial development policy, and for industrial development prospects in rural areas.

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Adopting Flexible Capital? Resolving a Paradox

Recent analyses of advanced manufacturing technology adoption among Canadian producers (McFetridge and Corvari, 1985; Statistics Canada, 1989; Ontario, 1989) have yielded the surprising result that Canadian plants have been adopting advanced equipment and practices in design and engineering, fabrication and assembly, material handling and inventory management, inspection and testing, and communications, integration, and control at rates that are comparable to or even better than their American counterparts. Leaving aside for the time being the important question of whether or not American manufacturing practice should be used as the proper standard of comparison, these findings clash strongly with a widely held perception that Canadian manufacturers' general standard of technological sophistication is substantially below that of their competitors in the United States, Western Europe, and Asia (Steed, 1989). Indeed, such impressions are not without empirical foundation. Over the period from 1979 to 1989, annual real productivity growth in manufacturing in Ontario (Canada's leading industrial region) averaged only 1.3 percent. This compares with 1.8 percent for the former West Germany, 3.6 percent for the United States, 4.0 percent for Italy, and 5.5 percent for Japan (Bakker, 1992).

How does one explain this technology adoption paradox? There are at least two possible ways to reconcile these apparently contradictory findings, both of which stem from the nature of the technology adoption surveys used to gather information about manufacturing practices. The periodic surveys conducted by Statistics Canada simply ask manufacturers to indicate whether or not they are currently making use of any of the various technologies and practices listed above. There is no opportunity for the firms to register how *extensive* is their adoption of such technologies (do they have one computerized numerically controlled machine, one dozen, or one hundred? Do they actually use the machine, or does it collect dust in the corner?). Nor does the survey determine how *effectively* they might be using these technologies.

While the first interpretation of the paradox is highly plausible, it cannot be substantiated in the absence of more careful survey techniques. However, there is considerable evidence in support of the second explanation, in the findings of recent indepth Canadian research examining adoption effectiveness (Meurer, Sobel and Wolfe, 1987; Beatty, 1987; ISTC, 1991). From all of these studies, it is clear that substantial and lasting difficulties of technology implementation are indeed widespread. These implementation pathologies include: productivity or performance enhancement that did not live up to expectations (or salesmen's claims), unexpectedly high operating costs, setup and break-in times much longer than promised by vendors, and difficulty integrating new production systems or components with older, preexisting systems.

Interestingly, the same kind of paradoxical results are evident in U.S. research. For example, the studies by Rees et al. (1985, 1986) revealed that machinery producers in the traditional Midwest and Northeast U.S. manufacturing belt were more prevalent users of numerical control (NC) and computerized numerically controlled (CNC) machine tools than were similar firms in other regions of the country. This finding gave the authors a degree of optimism about the capacity of producers in allegedly mature and declining industrial regions to rejuvenate themselves through the adoption of leading-edge process technologies. At the same time, more detailed studies of the *effectiveness* of adoption of advanced process machinery and production systems by American producers *in the same regions and sectors* (Jaikumar, 1986; Kelley and Brooks, 1988) demonstrate clearly the serious difficulties that American producers are encountering in employing such

process technologies effectively, noting that operating costs, setup times, and difficulty of use are far greater than originally anticipated, and that the ability of these general-purpose systems to meet quantitatively and qualitatively the output needs of these producers is frequently disappointing.

Likewise, similar results have been obtained in studies of this process as it is operating in Great Britain (Turnbull, 1989; Rawlinson, 1989), where it has become clear that producers in traditional manufacturing regions (some with well-established histories of successful innovation) have encountered major difficulties in adopting effectively new production processes and modes of organization. While substantial progress has been made in introducing new employment practices that enhance firms' ability to deploy their workers more flexibly (particularly through overtime and part-time work), the adoption of advanced manufacturing processes, themselves, has been far more problematic. In many cases, these problems have been serious enough to prompt firms to leave new machinery in some remote corner of their plant, while reverting to older production methods.

In short, it would appear that tracking the diffusion of a particular type of new, complex machine or process technology by simply gauging adoption/nonadoption (for other studies using this approach, see Martin, 1979; Oakey, Thwaites, and Nash, 1982; Gibbs and Edwards, 1985) is not an adequate research strategy for analyzing how firms acquire new production methods. Further attention must be paid to both effectiveness and extensiveness of use.

At the same time, the studies of effectiveness described above offer us important, but only partial, explanations of *why* these implementation pathologies should arise. While these studies were effective in identifying a serious problem for industry and public policy, they gave only incomplete clues as to the origins of these problems and how to solve them. The major strategic or policy implications drawn from this work included the need for much greater emphasis on worker training, and the need for managers and workers to jettison their traditional Fordist (that is, mass production) mindsets in their approach to production, relations with one another, and the firm's relations with the market.

While clearly important and helpful, such conclusions alone would probably be insufficient to fully reverse the fortunes of ailing Ontarian, American, or British firms. Yet, there are some clues in this work to suggest that the *geographical context* of the technology adoption process is of central importance. In his oft-cited comparison of Japanese and U.S. manufacturers using similar or identical flexible manufacturing systems, Jaikumar (1986) found the American firms to be using these technologies in startlingly rigid (and traditionally American) ways: a small number of products, each produced in long, standardized production runs. One of the central implications flowing from this finding was that American producers encountered serious problems in implementation because they were trying to adopt production practices in a social context other than the one in which they were originally conceived and built (the bulk of the machinery and/or organizational principles came from Japan).

Spatial Perspectives on Technology Adoption and Implementation

Given the suggestion that the technology adoption process is inherently geographical, as are the explanations for why firms in mature industrial regions such as Ontario and the U.S. Northeast

and Midwest have experienced implementation difficulties, it makes sense to explore in more detail the insights that might be brought to bear on this question by explicitly adopting a spatial perspective.

The Territorial Production Complex Approach

One approach to this question arises from the recent literature within industrial geography on the territorial production complex. In this emerging approach, a great deal of emphasis is placed on the importance of territorial clustering of interlinked producers who buy from and sell to one another (Scott, 1988a, 1988b; Scott and Storper, 1987). Such arrangements are deemed to offer participating producers (frequently small firms) the benefit of being able to respond at short notice to qualitative variations in demand by varying the kind (and source) of inputs used. The most significant costs involved, those associated with making these market transactions between producers, are held in check by transacting with spatially concentrated parties. Hence, the benefits of this vertically disintegrated form of development exceed the costs. Moreover, although internal economies of scale may be sacrificed in order to achieve this output flexibility, their loss is compensated for by the existence of external scale economies stemming from the agglomerated form of production.

Logically, the production of manufacturing equipment, machinery, and systems is one of the many functions that could either be performed by a firm inhouse, or externalized through the purchase of machinery through market transactions. But comparatively little of geographers' attention has been given to the question of machine purchase versus development. Much of the North American and British work in this area of the literature chooses to emphasize the vertical disintegration through subcontracting or simple purchase of parts, components, and subassemblies, based on the powerful metaphor of Adam Smith's pin factory and the classic Marshallian districts of gun, jewelery, and shoe manufacture (Holmes, 1986; Scott, 1988a; Rutherford, Imrie, and Morris, 1989). The acquisition of labor is treated in a similar manner for the same reasons.

At first blush, the logic of this approach appears to be compelling. After all, parts, components, and subassemblies (as well as labor) are the sort of inputs that seem to be required and acquired most frequently, and they constitute the lion's share of firms' operating costs on a day-to-day basis. Hence, one might expect these linkages to exert the strongest force to promote spatial clustering of buyers and suppliers. However, by focusing on the purchase or subcontracting of parts and components, or the more flexible use of labor, this literature all but ignores the firm's capital inputs (that is, the acquisition of machinery, equipment, and production systems). While these appear to be acquired less frequently, access to the best process technologies, and the ability to use them effectively, may still be of equal or greater importance to a firm's competitive success. To put this another way, in terms of quality, cost, reliability, or timeliness of delivery, it does not matter how good your other inputs are if your production process is not working properly or being used to fullest advantage. Hence, by failing to consider the relationship of manufacturers to the firms that produce their machines and production systems, the scholars working in this tradition may have overlooked an important influence on industrial performance.

Industrial Districts

One of the earliest suggestions of the important role to be played by providers of capital equipment and machinery emanates from the work of Brusco (1982, 1986) on industrial districts

in northeastern and central Italy. An especially interesting insight comes from his assertion that one of the distinguishing characteristics of a true industrial district "is the presence, in an area that produces a certain commodity, of firms that produce the machinery necessary for the production of that commodity" (Brusco, 1986: 190). This claim is made on the basis of Brusco's analysis of cases such as the ceramic tile production in Sassuolo, who are well supported by local producers of specialized and technologically advanced ceramic tile-making machinery. Similarly, in the textile-producing town of Carpi, producers benefit tremendously from the local producers of textile-making machinery (see Russo, 1985, for similar insights from the same region).

Strangely, this potentially fertile insight is all but ignored by geographers who have drawn inspiration from other aspects of Brusco's work. Indeed, Scott (1988a) even argues that, with capital deepening, as the relative importance of fixed capital in the production process increases, the power of the force encouraging related firms to cluster spatially is diminished. Echoes of Brusco's potent idea *are* found in the recent work by Storper and Walker (1989), who describe the process by which industrial locales or clusters provide a technological milieu where linkages between specialized producers, including machine producers, develop and flourish over time. However, despite the encyclopedic dimensions of this work, in which examples are drawn both from history and contemporary industrialization, their analysis of the spatial relationship between machine production and use is achieved only in passing, within the context of showing how newly developed approaches to production find application in a range of related and (seemingly) unrelated local sectors. Furthermore, while they note how the enhanced social division of labor, supported by territorially clustered production, might encourage specialized machine producers to spin out from formerly integrated firms, there is no explicit, detailed exploration of the particular benefits of this industrial organization for both parties involved.

Piore and Sabel (1984) have built on Brusco's work in their analysis of industrialization in parts of Italy and West Germany, observing on several occasions the spatial coincidence of manufacturers in a particular sector and of firms specialized in making the machinery needed by these manufacturers. Extending this argument, Sabel et al. (1987) describe in some detail the mutually beneficial relationship between the German textile industry in Baden-Württemberg and firms in the same region that have mastered the building of leading-edge textile-producing machinery. The latter, in helping their local customers gain a technological edge on their foreign competition, have ultimately also been successful in winning export markets for their machinery.

The upshot is that there appear to be certain advantages to both parties that arise when machine users and producers of related machinery are located within close proximity of one another. Important as this insight is, we are still left with a number of unanswered or only partially answered questions:

> First, must machine users and machine producers *always* be close to one another? Under what conditions would this be especially important?
>
> Second, in such cases, how close is close? Is it satisfactory for both parties to be simply within the same country, or must user and producer be closer together than that (same region, same urban area, same district)? What impact do national boundaries exert on this relationship?
>
> Third, *why* is this closeness important?

User-Producer Interaction and Technology Acquisition in Spatial Context

Ironically, one must look to sources outside of geography *per se* for more detailed conceptual answers to these questions, especially to recent work emanating from the intersection of two related literatures, such as the economics of technical change and industrial organization theory. Lundvall's (1988) contribution is particularly noteworthy as the first to really tackle the third question directly and systematically. In doing so, he has some important things to say about the first two questions as well. He regards process innovation as neither of the polar Williamsonian extremes (Williamson, 1985) of a pure market transaction between firms or the inhouse product of an organized hierarchy. Instead, he sees the process of development of complex production equipment as one requiring close and frequent contact between the producer of the equipment and the ultimate user. This interaction occurs not only during machinery design, development, and customization, but also during installation, startup, training, and subsequent regular use (for debugging, repair, modification, and updating).

A number of important implications flow from this conceptualization. First, when one views machine production in this way, it becomes apparent that machine acquisition is *not* a one-time-only transaction as commonly thought, but rather is a process of significant duration, consisting of three stages: design/development, installation/startup, regular operation. Furthermore, this process has important shared, social dimensions. It is this lengthy and shared nature of the machine acquisition process which makes closeness between user and producer particularly useful, as it best fosters the necessary frequent and detailed interaction between these two parties. Third, because the transaction of selling/purchasing capital equipment is characterized by a high degree of uncertainty (since the user is usually buying a long-lived product whose full qualities are largely unknown to the user-purchaser), an enduring relationship based on trust is important in ensuring an effective transaction. This, too, is best developed when user and machine maker are within easy reach of one another. Finally, because of the customization, modification, and adjustment which will likely take place during this production process, each application of a given technology is, to some real extent, qualitatively unique.

We now have a more complete answer to the third question posed above, but what of the other two? With respect to the first set of questions, Lundvall argues that these considerations will be particularly important where the machinery in question is particularly complex, embodies recently innovated technology in a machinery industry undergoing rapid change, and is expensive (true virtually by definition if the first two conditions obtain). While simpler, cheaper, mature, or slowly changing equipment might simply be bought "off the shelf" with no negative consequences (having been developed by the producer in isolation from the user), acquisition of complex machines requires extensive interaction between user and producer. Consequently, when machinery is complex and embodies new technology subject to rapid changes, clustering of users and producers to enable frequent face-to-face contact becomes extremely important. Thus, those industries and firms using complex new production technologies will compete most successfully when the producers of their equipment are located nearby.

One can use these new ideas to offer fresh interpretations of some of the phenomena reviewed above. For example, they cast a somewhat different light on the success of the industrial districts, suggesting that a part of manufacturers' success there stems from their close relations with local producers of their process technologies. But these ideas might also help us to interpret the failures of producers in Ontario and other mature industrial regions undergoing restructuring,

thereby resolving the paradox of high rates of adoption but unimpressive industrial performance. Using Lundvall's framework, these failures can now be seen to result from two possible circumstances. Either machine users in such countries are too far away from the producers of leading-edge production technologies (increasingly overseas) to allow beneficial and essential interaction to occur, or there is a mismatch between the characteristics of the equipment being purchased and the strategy pursued to make the purchase. In simple terms, when inexperienced users try to buy complex machines incorporating new technologies in an "off-the-shelf" fashion, expecting them to be simple turn-key operations, the effectiveness of their adoption is severely constrained. Given that an increasing share of world production in advanced machinery and machine tools is now coming from Japan and the former West Germany (ISTC, 1988, 1991), with formerly innovative production in the United Kingdom and the United States now in decline (Melman, 1983), it should come as no surprise that British, American, and Canadian manufacturers are having trouble adopting these new process technologies. For Ontarian manufacturers, the retreat of American machine tool makers from many of the key product markets they once dominated (Graham, 1992) is clearly unfortunate. The upshot of this argument is that, while these relatively new technologies are indeed being adopted in Ontario and other mature regions, the distant origins of these machines, production systems, and practices act as a major impediment to their effective application.

It is clear both from Lundvall's work, as well as that of Sabel et al. (1987), that there are other benefits to be gained from this interactive process, both for machine users and producers. Users benefit from having access to machinery that is more likely to have been customized or tailored to meet their particular needs, possibly giving them an important competitive advantage. At the same time, machine producers may develop a stronger hold on their markets if, through the development of a long-term understanding of their users' needs, producers can provide a superior product to the market. In addition, many important technological insights originate with users, and producers' interaction with them provides an essential source of innovative ideas (on this general theme, see von Hippel, 1988).

A similar line of argument has also been advanced (apparently independently) by Stowsky (1987; see also Methé, 1991), whose analysis of semiconductor manufacturers in the United States yields findings that are strongly consistent with Lundvall's approach. In comparing U.S. semiconductor producers to their Japanese counterparts, he focused particularly on the relationship between the firms that make the machinery and equipment required for the manufacture of semiconductors and the semiconductor producers (machine users) themselves. According to Stowsky, the nature of this relationship could not be more different in these two countries. In the United States, the user-producer interaction is described as short-term and arm's length, with little information sharing and considerable distrust and even hostility between the two groups. The end result is a set of users (semiconductor producers) who have become heavily dependent upon machinery and equipment suppliers for innovations and improvements. In Japan, the relationship is characterized as long-term and close, with considerable cooperation, trust, and even ownership links between the two sectors. There is also frequent and open sharing of information, as machine producers seek to customize their product to suit more closely the needs of the user-buyers. In essence, unlike the American case, the process of innovating in machinery and equipment is much more likely to be shared, producing important benefits for both users and producers.

Stowsky observes that "innovations in the equipment sector have sparked--and continue to spark--key technological advances. Consequently, for both chipmakers and indeed final product industries, the manufacturing know-how gained through managing the process of equipment development constitutes an increasingly crucial source of strategic competitive advantage" (Stowsky, 1987: i). Hence, it should come as no surprise that the Japanese chipmakers have overtaken American producers in many world markets, including their own. Stowsky suggests that at least part of the blame for this set of circumstances resides in American industry's traditional approach to new production technologies, fed by a strongly individualistic tradition, in which they desire and expect all of the technical knowledge required to extract the potential productivity from machinery to be embodied and commodified within the equipment itself. By contrast, Japanese manufacturers expect much of this information to be produced through the extended interaction with their machinery producers, since this know-how simply cannot be embodied completely within the physical equipment itself, but can be produced and transferred only through a joint process of learning by doing. The minimal interaction between U.S. chipmakers and their machinery suppliers discourages this learning by doing, since it inhibits the transfer of knowledge from machine producers to chipmakers (and back again).

The interaction perspective provides still further insights on other kinds of problems that might arise to prevent the effective adoption of advanced process machinery (or indeed, the creation of unsatisfactory innovations). Not surprisingly, this approach implicates both users and producers of machinery as the source of potential problems.

Problems Stemming from Deficiencies of Technology Users

Lundvall notes that a key determinant of the development of an innovative capital goods sector is the *quality of demand* arising in the home market of the machine producer. Competent and demanding users will induce producers more strongly to generate innovative products and, indeed, "the lack of competence of users and the tendency of producers to dominate the process of innovation might be as serious a problem as a lack of competence on the producer side" (Lundvall, 1988: 358). He cites here the example of the Danish dairy industry, where many small, technologically unsophisticated users (dairy farmers) were dominated by a small number of powerful, scientifically sophisticated dairy equipment makers who unilaterally controlled the innovation process. The result was an unsatisfactory circumstance characterized by excessive "hyperautomation." The essential point here is that more demanding and sophisticated users, especially in the home market, make for better process innovations more likely to serve the needs of the user community.

Interestingly, Porter (1990) has recently taken up the same idea as a result of his 10-nation study of industrial competitiveness. Indeed, Porter also reviews the experience of the Italian industrial districts, focusing on a case examined by Brusco (1986) and Storper and Walker (1989)--ceramic tile production in Sassuolo--and sees their success in the territorial clustering of advanced machine producers serving the needs of a highly competent and demanding market of local commodity producers. The successes of the local machinery industry are thus dependent upon the success of the local producers to whom they sell, but also become a key determinant of these users' future competitive success. Rosenberg (1982) has made similar arguments in a historical vein when reviewing the rise of the American machinery industry to a position of dominance over its British counterpart in the early 20th century. While his argument is not couched in an explicitly spatial manner, he does contend that "American producers of machinery and their users had, at an early

date, developed a far more successful network of interrelationships than had occurred in Britain . . . . In America the relationship between machinery makers and customers contributed to an interchange of information and a communication of needs to which the machinery producer gradually learned to respond in highly creative ways" (Rosenberg, 1982: 14). It would appear that contemporary American machinery producers have lost much of their past ability to interact effectively with their market.

A second deficiency associated with machine users is that they sometimes seek to shun or actively shut out specialized machine producers, preferring instead to develop and manufacture their own machinery inhouse. This choice often stems from a basic lack of trust of outside machine producers, and the resultant fear that confidential details of the user's proprietary technology might be leaked to competitor firms through the vector of a machine producer that serves both users. The end result, as Stowsky (1987) has pointed out in connection with American semiconductor production, is that both users and producers suffer by being denied participation in a mutually beneficial process of shared equipment development and social learning by doing. In this light, it is interesting to note the recent resurgence of chip producers in Silicon Valley, a turnaround which Saxenian (1990) attributes to the reestablishment of trust-based relationships between equipment users and producers in response to crisis conditions stemming from Japanese competition.

A third type of user deficiency that can yield negative results (for producers) is represented in the special set of problems associated with defense-related users. Here, Melman (1983) has spelled out the problems created for many U.S. machine-tool producers as a result of the purchasing behavior of their customers when the latter happen to be defense-related companies or Government defense agencies. The cost-plus nature of contracting in this industry has, in Melman's view, removed the necessity for machinery producers to be keep their costs as low as possible, thereby encouraging them to become inefficient and uncompetitive in world markets. Understood in the light of the preceding theoretical discussion, this circumstance too can be seen to result from the failure of users to be more demanding (though now in terms of cost rather than technological specifications). Put another way, technologically sophisticated demand is insufficient on its own if there is not also strong enough cost pressure on producers.

Problems Stemming from Deficiencies of Technology Producers

The principal source of difficulty arises from producers who may be indifferent to the specialized needs of the firms that use their machinery. Such a condition may exist when there is only limited competition in the machinery market, allowing producers to become complacent in their relations with their customers. Stowsky (1987) notes that American producers of chip-making equipment could be characterized in this way, at least until the rise of serious competition from Japanese equipment producers who began exporting into the U.S. market. While the interactive approach would suggest that such a long-distance transaction (between Japanese producers and U.S. users) would not be conducive to productive interaction and highly effective technology implementation, so long as the American producers failed to engage users in a closer, trust-based relationship, they would possess no major home-country advantage in their competition with the Japanese over the U.S. market.

Sabel et al. (1987) have made a similar argument in comparing textile-machinery makers in the United States and Germany. Before foreign competition posed a serious threat to U.S. machinery

producers (that is, prior to the 1960's), they were able to dominate their customers, dictating designs and virtually ignoring their users' technological demands. Sabel et al. summarize this attitude succinctly in the purported statement of one machinery builder to its customers: "Here is what we produce. How many do you want?" (Sabel et al., 1987: 29). Users were thus forced to make their own modifications to the limited range of standard designs they were able to purchase. The end result was ultimately disastrous for the U.S. machine producers. Their users "modified standard machines to increase efficiency or achieve new effects and kept the results of their tinkering to themselves. This cut the machine makers off from an invaluable source of new ideas." The situation began to change only in the 1960's, as textile makers became large enough to feasibly source their equipment from European producers who, to the surprise of the mill owners, were willing to customize their machinery to suit the American users' particular needs. German textile machinery producers had a particular competitive advantage in this, having long been used to solving the specialized technological needs of a wide variety of users. In a European market where British equipment producers had cornered demand for more standardized machinery in cotton fabric production, German machinery builders competed by serving highly specialized but variegated and changing niches.

Counterarguments: The Unimportance of User-Producer Clustering

The preceding section spells out the arguments concerning why and under what conditions a close relationship between machine producers and users might be important. But in doing so, it raises another important question: is the spatial clustering of machine users and producers really necessary, even in the presence of those conditions in which the theory tells us it is most likely to arise (that is, where machinery is complex, rapidly changing, and expensive)? In this section, we shall consider a variety of reasons why clustering might *not* be necessary to support effective technology adoption by users.

Internalized Machine Production

Clustering between machine users and external producers may be unnecessary in those instances where users have decided to produce their own complex machinery inhouse. Such a decision may be prompted by the desire to protect proprietary process technologies that constitute a significant part of the firm's competitive advantage, since (as noted earlier) external sourcing of production equipment may introduce the risk of leakage or unwanted diffusion to the firm's competitors via the machine producer. Indeed, the long-term, iterative nature of the machine production process, incorporating all three phases of design, installation, and debugging/modification in regular operation, might lead some firms to internalize this function. This would be especially likely in the absence of a specialized external producer that is both trustworthy and willing to design to suit custom needs. Such suppliers may not be easy to find, and this kind of relationship cannot be obtained instantly but takes time to build up.

However, the decision to produce machinery internally is not one that is taken lightly, since there may still be powerful countervailing forces at work that favor externalization. Foremost among these is the existence of economies of specialization enjoyed by external machine producers. Despite the fact that they may be customizing their products for individual user-buyers, there are still likely to be certain base or core technologies common to each unit produced. Furthermore, firms specializing in meeting the diverse and changing needs of their many different user-

customers will likely possess certain efficiencies in solving a wide range of production problems. Both of these considerations allow firms specializing in machine production to function at greater efficiency, to produce more cheaply, and, possibly, to offer a range of technological solutions superior to what would be available to users trying to produce their own machines inhouse. Obviously, the greater the degree of standardization in equipment, the stronger will be this particular pressure to externalize the machine acquisition process (although with standardized equipment, the need for a *nearby* external producer is diminished). But even with complex and specialized machinery, this externalization force could be considerable.

A related though distinct force in favor of externalization is the possible mismatch between the scale at which the user would be producing machinery inhouse (to serve its own demand) and the scale at which machine production would be most efficient. This idea, which Scott (1988a) has applied to the sourcing decisions of other production inputs, may also be responsible for the firm's decision to seek an external source for its machinery. However, there are at least two shortcomings of this form of analysis. First, this analysis relies on the presumption that the externally built machine has the identical characteristics to one that might be produced inhouse. For the reasons presented above, this may not in fact be the case. Furthermore, the preceding discussion makes clear that a comparison of internal versus external machinery production by the user is made not solely on the basis of the single dimension of price. Consequently, this form of analysis offers only limited insight into the "make or buy" decision in this context.

As a special case of internalized production, Lundvall (1988) notes that vertical integration can produce a multilocational corporate structure through which process technologies can be transferred effectively over very long distances: "The development of transnational capital and of vertically integrated firms operating all over the world reflects that 'organizational proximity' may overcome geographical and cultural distance" (Lundvall, 1988: 355). In such instances, innovative, complex machinery produced in one of the corporation's plants would be readily spread to other plants within the firm at another location. For the latter plant, problems related to trust and the threat of information leakage to competitors would not be an issue. And presumably, the corporation would support its installation of equipment through efficient intracorporate deployment of specialized service and advisory personnel. Of course (as Lundvall notes), while this arrangement may offer certain benefits to the user plant, the vertically integrated corporation may ultimately suffer from its lack of interaction with innovative producers (and users) of machinery outside the firm. As we shall argue in a later section, independent machine users outside the firm may also suffer in the presence of vertically integrated multinationals.

Telecommunications Links and Other Substitutes for "Being There"

If the foregoing analysis is correct, then the firm using complex, innovative, and expensive machinery would be best served when the vendor-producer from which it buys such equipment is close by (we shall address the specifics of how close in a following section). Similarly, the producer firm would also prefer to be located nearby to its customers, in order to allow for productive interaction over time. However, certain practicalities might intervene to prevent machine producers from locating close to their customers. First, in the likely event that the machine producer serves more than one user-customer, and these customers happen to be far apart from one another, it would obviously be difficult for the producer to be physically close to each user. In such instances, telephone, fax, and computer network links for information flows, plus air, automobile, and truck links for transportation of advisory, training, and service personnel

(as well as for delivery of replacement parts) might offer a reasonable substitute for spatial proximity.

Indeed, basic central place theory would suggest that if the machine producer is making very highly specialized equipment, then the producer may require a very large geographic market of national or even international scope, in order to provide threshold levels of demand for the firm's output, particularly if the population of user-customers is itself distributed in low-density fashion. From the producer's point of view, an ideal solution to this conundrum would be to locate in the midst of a large economic agglomeration in which multiple major customers are also to be found.

From the user's point of view, it is likely that certain of its own attributes, particularly size, would influence the degree to which it is well served by distant machine producers. In a manner that is analogous to firms' access to financial capital (see Gertler, 1984), it is likely that large user-customers (no matter where they are located) will be well served by even distant equipment producers, while small users may not be so lucky. If a user represents a large and important source of demand for a machine-producing firm, then the producer will have a strong incentive to interact effectively with the user, even over long intervening distances, perhaps by appointing local service personnel to represent the machine vendor. Indeed, there are numerous anecdotal examples within the literature of distant, even international, external supply links for complex, specialized machinery. For example, while giving few details, Sabel et al. note that specialized German machine-tool makers, as well as Fiat's machine-tool building subsidiary Comau (in Turin, Italy) collaborate closely with user-buyers in many countries (Sabel et al., 1987: 34). Furthermore, it is well documented that Japanese producers of advanced machine tools and industrial robots, as well as Italian producers of specialized advanced machinery for the manufacture of footwear, leather goods, ceramic tiles, and other products have been successful in finding international markets for their products (Porter, 1990).

However, it remains to be demonstrated that these exports have been tailored to individual users' detailed specifications, or that users abroad have been able to implement such machinery as effectively as other users located closer to the producer's plant. One way of understanding this issue is to remind oneself of the three-stage nature of machine production and to ask if it is sufficient for users to interact effectively with producers at only one or two of the three stages. For example, if a distant user is well served at the installation and operation stages of machine acquisition, but not at the design/customization phase (or vice versa), then will this instance of technology adoption be as effective as that of some other competitor-user which enjoyed effective interaction with the producer at all three stages of production? These are important questions, on which the existing literature is, effectively, silent. Here, then, we come full circle, recalling our initial observations that companies in locations distant from the current sites of process technology innovation appear to be having considerable difficulty adopting new, complex technologies effectively.

How Close is Close?

Thus far, we have skirted the question of just how close users and producers must be to one another for effective interaction as described above to occur. This avoidance has not been entirely accidental, as the existing literature contains few explicit clues to guide us. The little commentary on this subject that does exist suggests that a crucial spatial category is the nation-

state, although the reasons advanced differ from one author to another. For example, Lundvall (1988) places considerable emphasis on culture, claiming that a common cultural background and language facilitate the kind of detailed communication crucial to the success of user-producer interaction. Furthermore, within the nation-state, even closer contact might be required:

> When technology is complex and ever changing, a short distance might be important for the competitiveness of both users and producers. Here the information codes must be flexible and complex, and a common cultural background might be important in order to establish tacit codes of conduct and to facilitate the decoding of the complex messages exchanged . . . . In the absence of generally accepted standards and codes able to transmit information, face-to-face contact and a common cultural background might become of decisive importance for the information exchange (Lundvall, 1988: 355).

National boundaries may be significant for other reasons as well. Both Lundvall (1988) and Stowsky (1987) agree that certain institutional characteristics of nation-states foster easier interaction between users and producers within the same country than the same interaction across national boundaries. Following Freeman (1987), Nelson (1988), and others, they assert the importance of distinctive national systems of innovation which define a common set of standards and regulations to facilitate interaction. National governments may also stimulate and support the formation and maintenance of networks of producers in particular sectors, and may orchestrate relations between users and producers, much as MITI has done in Japan. Nation-states also define distinctive relationships between financial and industrial capital which may be more or less likely to predispose industry to engage in risky innovative activity with long payback periods. Furthermore, given that much technical knowledge is never embodied in finished commodities or machinery and equipment, but rather comes to reside within the skilled labor force through the process of learning by doing, the limited international mobility of skilled workers acts to contain a good deal of a nation's distinctive technology within its borders. Finally, past traditions of industrial practice also seem to be nation-specific, such as the fragmented and individualistic nature of intra-industry relations that characterize the American semiconductor industry as described earlier.

A closely related argument has been made recently by Gordon (1989), who reviews the American, Japanese, German, and Italian national models of production and innovation. He emphasized the distinct "culture" of each system and how it seems to produce current practices. For example, he highlights German practice, where (in common with Stowsky's analysis of the Japanese chip industry) a dominant idea is that technology cannot be solely or fully embodied within machines, but is fully realized only with the extensive effort of skilled labor. As Gordon points out, this approach responds nicely to the institutional rigidities of the German labor market, since these encourage employers to maintain a stable employment relation with their workers, in which the former provide job security, opportunities for worker involvement in shopfloor decisionmaking, and the training required to learn how to extract the maximum effectiveness from a machine or production system. Gordon further suggests that this culture (which can really be understood as a set of accumulated industrial practices, institutions, and social relations of production) has been incorporated very strongly into the design of German machine-tools, since such designs "assume that the most sophisticated performance levels can only be achieved through a combination of advanced technology and human labor, not through automation alone" (Gordon, 1989: 21).

To the extent that this is true (and to the extent that other nations' industrial culture differs markedly from German practice), then, this might make German-designed machine-tools that much less portable, that is, that much less productive when adopted outside their original culture of innovation and industrial practice. These insights reverberate with Jaikumar's (1986) findings concerning the American use of Japanese-designed flexible manufacturing systems reviewed earlier. According to this view, then, perhaps distance *per se* between machine producer and user is not the issue. Physical distance may serve only as a proxy for social or cultural distance (where we understand culture to be defined as above). This argument thus ascribes considerable importance to national boundaries because nation-states create those institutions which actively define and maintain distinct industrial practices by, for example, shaping labor market policies, setting up training systems, and so on.

Other barriers to the international flow of process technologies include: (1) the less well-developed training and maintenance services that typically characterize foreign producers' competing outside their home market; and (2) what Stowsky calls "strategic technology hoarding" (Stowsky, 1987: 9), in which foreign firms (out of commitment or loyalty to their fellow domestic producers) obstruct the export of their most advanced machinery, restricting its availability only to users in the same home country. For these reasons, plus the absence of the social, joint process of collaborative machine production, "purchases of foreign-developed technology cannot substitute for a domestic sector's intimate involvement in the process by which that technology has been developed" (Stowsky, 1987: 8).

As evidence of the advantage that home country machine producers would have in serving users in the same domestic market, Lundvall (1988), Stowsky (1987), Porter (1990), Rosenberg (1982), and Sabel et al. (1987), all make reference to the spatially bound nature of this relationship and give examples of the co-location of producers and users in the same region. For example, Stowsky (1987) notes that when Japanese chipmakers like NEC set up production facilities in the United States, they induced their principal equipment-producing companies also to set up plants at the same production sites. Similarly, Porter (1990) builds his theory around the mutual advantages accruing to interacting users and producers in the same country, with copious examples of users and related producers in the same region or urban area. Yet neither considers the issue of how far away one party might be from the other and still enjoy fruitful interaction. Even Brusco's (1986) original insight, concerning the co-location, in the "true" industrial district, of manufacturers of commodities and the manufacturers of machinery required to make these commodities, is not very specific about the frictional effects of distance in this relationship. He merely notes that they should be in the same "area" (Brusco, 1986: 190).

Clearly, there are many unanswered questions remaining here. To add to this list, can we expect that the importance of physical proximity between machine producer and user has declined over time, with the improvement in communications and transportation technologies? Is it now possible for producers to serve effectively a set of users distributed at wide distances from one another, at least within a single large country such as the United States or Canada? And what about some other impacts of national borders on trade in machinery? How important a problem are tariff barriers (and how is this changing with the advent of freer trade on a continental basis)? One traditional pet peeve of Canadian users of imported machinery is that irritating delays have been caused by the difficulties encountered by machine vendors' service personnel as they attempt to gain entry into the country from abroad.

The Social Context of Machine Production and Use: Implications for Theory and Policy

Geographical Trade Theories

The approach spelled out above, emphasizing the importance of the social context of machine production and acquisition, holds some interesting implications for economic theory, both geographical and otherwise. For example, traditional geographical theories of markets and retail behavior (for example, central place theory) hold that the only attribute of a particular good which varies over space is its delivered price (market price at some central location, plus the cost of transporting the good to the consumer), which helps to determine market areas for individual vendors. If this analysis is correct, this approach may be inappropriate for the analysis of spatial trading of complex capital goods, since it is not just the delivered price that varies with distance. Also varying would be the probability of a high-quality relationship between buyer (user) and seller (producer), and thus also the probability of effective implementation (and, therefore, productivity increases associated with the capital good). Thus, users located at or near the source of the machinery would enjoy qualitative advantages in machine use above and beyond simple availability at a lower market price.

Moreover, these observations are especially likely to hold true if an international boundary intervenes between the two trading parties. Hence, there might also be some important insights into theories of international trade and comparative advantage flowing from this perspective. Advocates of comparative advantage traditionally argue that countries should specialize in those economic activities which they can perform most efficiently, while trading for those commodities that are more efficiently produced elsewhere. This logic would dictate that those countries (such as Canada) that do not have a well-established tradition of domestic machinery production would be best advised to import their capital goods rather than attempt to build up their own machinery-producing sector. The folly of this approach and the obvious policy implications that flow from it, however, is that industrial users in such countries will simply *not* be as competitive as their counterparts abroad, if their imported machinery has not been designed to suit their needs, or was produced in a country whose culture of industrial practices is not similar to their own. Even if the machinery does represent a workable match to the importing users' needs, the importers may still not receive a level of service in stages two and three of machine acquisition that is necessary to ensure effective implementation of the foreign-built equipment. Or, if they do, it may be achieved only at considerable extra cost to them.

Policy Implications: Backward Linkages, Foreign Ownership, Technology Transfer, and Rural Development

A number of policy implications flow from this analysis. The most obvious is that there is much to commend in policies that encourage the development of capital goods industries upstream from other goods-producing (and service) sectors. This strategy has been a key to the great success of established industrial powerhouses like Japan and Germany (Freeman, 1987), as well as an important ingredient in the rise of new industrial powers like South Korea and Taiwan (Amsden, 1989; Graham, 1992) which have staked the development of their manufacturing prowess on the supported development of an indigenous advanced machine-tool industry. It has also been a symptom of successful industrialization of some of the so-called "small developed countries"

(SDC's) such as the Nordic economies (Freeman and Lundvall, 1988). For example, Lundvall (1988) notes the development of the timber harvesting and processing equipment industry in Sweden, the dairy equipment industry in Denmark, and the fisheries equipment sector in Norway, all of which arose to meet the needs of domestic demand, but have since gone on to serve markets beyond their borders.

Instances where such backward linkages have failed to develop domestically may also be instructive. Here, Canada and Ontario are cases in point. Despite the dominance of resource-extracting industries, Canada has not had great success in developing indigenous capital goods sectors to support these activities (see, for example, Hayter, 1988). Similarly, despite having a long-established manufacturing sector in central Canada (particularly in Ontario and Quebec), its industrial machinery sector is, with a few notable exceptions, rather woefully underdeveloped and highly dependent on imports (ISTC, 1988, 1991; Science Council, 1991). This fact may serve to explain, at least partially, Canadian manufacturers' current difficulties in adopting complex machine technologies, and their consequent declining competitiveness in international terms (see Gertler, 1991, for the more complete argument). An important feature that distinguishes the Canadian (and especially Ontario) context from others is the traditional prominence of foreign-owned branch plants of multinational corporations. This situation places would-be Canadian advanced process technology users at a substantial disadvantage because of the tendency of foreign-owned firms to import their process technologies from their parent companies or suppliers abroad, rather than demanding it from local providers. Certainly, as was noted earlier, the internal organization of the integrated multinational provides an efficient vector for transferring advanced technologies over long distances. The problem is that this transfer is exclusively intra-firm. Not only are the mechanisms for diffusion from branch plant manufacturers to independent Canadian manufacturers strongly inhibited, but as well, the foreign sourcing of complex machinery by multinational branch plants removes from the Canadian market a potential source of demand that might otherwise stimulate the development of fledgling Canadian industrial machinery producers.

A strengthened indigenous machine-producing industry would thus provide strong benefits to domestically owned manufacturers in a variety of sectors by establishing a process of productive interaction as envisaged by Lundvall (1988), Stowsky (1987), and others. In addition, policymakers should seriously consider encouraging foreign, leading advanced machinery and systems producers to invest directly in Canadian operations, so that Canadian users might benefit from closer interaction with them. The success of this strategy would rest heavily on the ability of the Canadian labor market, training and educational institutions to produce the highly skilled labor, in sufficient quantities, to satisfy the needs of such incoming (and domestic) producers, something that has not been achieved with great success up until now. In essence, then, the important advantages that might flow from a well-developed, indigenous, capital goods sector are being suppressed by the predominance of foreign-owned machinery/systems users whose operations are not well integrated into the local economy. So long as this situation remains in place, then (by the argument stated above) the rest of Canadian manufacturing will, for the most part, be consigned to chronic mediocrity by global standards.

In many ways, the experience for Canada as a whole is instructive for rural areas in the United States and other countries. One could argue without too much difficulty that the same kinds of structural deficiencies that are all too evident, even in Canada's industrial heartland, are also found in many rural areas: an underdeveloped indigenous machine-building capability,

considerable distances to the nearest producers of advanced machinery, and a prominence of nonlocally owned branch plants with few backward linkages to other sectors within the host region. To the extent that this analogy holds, then so too do many of the policy implications of the preceding discussion.

In addition to the suggestions for policy offered above, it is important to emphasize the importance of publicly sponsored institutions for promoting effective technology transfer, either for countries like Canada, or for rural areas in general. Such centers, reminiscent of the more traditional agricultural extension services, can act as important intermediaries between machine producers and users, perhaps to compensate at least partly for any inadequacies that might exist. An example would be in the level or quality of machine vendor-provided service available in remote locations, in for the inability to achieve or sustain direct contact with producers of advanced manufacturing process technologies. This kind of assistance would presumably be most useful in those manufacturing regions marked by a paucity of indigenous machine producers. There is now a growing literature on the role that such centers have played in mature industrial regions of countries like the United States (for a useful summary and analysis, see Shapira, 1990b). It should also be made clear that even in those countries where machine producers and users have a tradition of effective interaction, such as Japan and Germany, such centers have still played an instrumental role in aiding the successful diffusion of key process technologies, particularly to small and medium-sized users (Shapira, 1990a; Cooke and Morgan, 1990). In the end, however, if this analysis is correct, such centers can be seen only as rather imperfect substitutes for the kind of creative interaction that may occur when machine users and producers collaborate closely over extended periods of time.

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Service-to-Manufacturing Linkages Among Small- and Medium-Sized Firms: Prospects for Rural Industrialization

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Introduction

The importance of multimode innovation is widely recognized in the modern literature on industrial competitiveness (Porter, 1990). Firms that simultaneously introduce new products and better manufacturing methods typically outperform their counterparts that focus upon one innovation mode alone (Calantone et al., 1988; Kotabe, 1990). Firms that supplement their product and process creativity with improved management, however, usually fare best of all (Freeman, 1991). A recurring theme in this research is that failure to connect technical innovation with other aspects of company management can lead to poor business performance (Rothwell and Bessant, 1987). Poor business performance, in turn, can retard the innovation thrust of both small and large firms alike (Sweeney, 1987), leading to a vicious cycle of decline that may ultimately end in market exit (Maillat, 1990).

To avoid this type of outcome, many firms have been turning to external sources of expertise in an effort to supplement their inhouse skills (Britton, 1991; Malecki, 1992; Smith, 1990). This trend can be viewed as a form of management innovation in itself, if only because successful recourse to outside talent typically requires perceptive leadership within the firm, an ability to specify and evaluate the external input environment and, more important still, an ability to identify areas of internal weakness across key dimensions of the production and marketing sequence (Rothwell, 1991). While certain types of firms are well equipped to optimize their innovation trajectory on the basis of inhouse competence (Edabi and Utterback, 1984; Oakey, 1984), others appear to benefit appreciably from outside help (Falemo, 1989; Stokman and Docter, 1987). This is especially true for small- and medium-sized manufacturing firms (SMF's), notably those that operate with limited scientific, technical, and/or financial resources (Beijie, 1987; Docter et al., 1989).

The importance of SMF's to industrial job-creation is widely acknowledged (Birch, 1987; Phillips et al., 1991), and the same can be said for export development (Dichtl et al., 1990; Ong and Pearson, 1982), import substitution (MacPherson, 1989), and innovative product design (Britton, 1991; Rothwell, 1989). Yet, as Hitchens and O'Farrell (1988) note, scant empirical work has been carried out on those factors that promote or restrain good market performance among comparable SMF's in different regional settings. Moreover, rather little is known about the extent to which a firm's local milieu acts as a constraining or facilitating element in the growth and development of its market position. While a number of structural and place-specific factors have been identified in the research on SMF innovation (Hitchens and O'Farrell, 1988; Oakey et

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al., 1987), few studies have examined the potentially interactive relationships between new product development, external knowledge-sourcing, and SMF performance.

Keeping these points in mind, the goal of this paper is to shed empirical light on three principal questions. First, are external technical linkages important to the commercial interests of innovative SMF's? Second, to what extent is local service provision a necessary condition for efficient input retrieval? And, third, what are the long-run prospects for SMF development in nonmetropolitan regions that contain weak supplies of technical expertise? Data for the inquiry come from a postal survey of SMF's in six sectors of the Upstate New York economy, including industrial machinery, electrical products, furniture, textiles, scientific instruments, and metal fabricating. Prior to an examination of the data, however, it is pertinent to outline a brief research context. Why are external service linkages worth looking at? And, why has recent work on such linkages paid special attention to SMF's?

Research Context

Several scholars have noted that the local milieu can have a major influence upon the growth prospects of small firms (O'Farrell and Hitchens, 1990; Maillat, 1990). For example, venture capital and other sources of investment funds are typically underdeveloped in peripheral regions. The same can be said for the quality of the business service environment (Beyers, 1990; Coffey, 1992), the strength and sophistication of local demand (Porter, 1990), and the supply of professional, technical, and management expertise (Malecki, 1991). Several analysts have found that SMF's in peripheral or declining regions exhibit a lack of price competitiveness in both domestic and international markets as well as weak expertise in product design, process engineering, and research (Britton, 1989; Hitchens and O'Farrell, 1988). For some SMF's, however, problems of this ilk can be partially mitigated by subcontracting task-specific work to external consultants, university research units, and/or larger industrial firms (Calantone et al., 1988). A notable thrust in this literature is that certain types of firms can improve their innovation performance by delegating specialized technical work to outside organizations (Rothwell, 1976, 1977, 1989). Such organizations, in turn, can assist the competitive efforts of SMF's by supplying critical knowledge-inputs in areas such as marketing, production-engineering, applied research, and design (O'Farrell and Hitchens, 1990; Rothwell, 1991).

From a spatial perspective, policy interest in the input-output relations between industrial and producer service establishments stems from a suspicion that close proximity between these sectors is a necessary condition for efficient interaction (Harrington et al., 1991). Partial support for this position has been documented by Ellwein and Bruder (1982), Kok et al. (1984), and Meyer-Krahmer (1985), while a modeling approach based on economic theory has been supplied by Lentnek et al. (1992). Other things being equal, SMF's that operate in regions with poor producer-service endowment are likely to exhibit weaker performance than comparable firms in service-rich locations. Moreover, if we accept the balance of technological evidence summarized by Freeman (1991), Malecki (1991), and Rothwell (1989), among others, a further implication is that certain types of firms are locationally disposed toward weak performance (O'Farrell and Hitchens, 1990). A second pertinent research theme comes from a number of theoretical strands on the motives that propel the outsourcing decisions of manufacturing firms (Coffey and Bailly, 1991; Goe, 1991). While each of these motives is described later, at least three contextual statements deserve initial emphasis. First, a substantial amount of technical knowledge is

exchanged between firms on an informal or nonmarket basis (Sweeney, 1992). Second, the extent to which small firms rely upon the external information environment varies substantially by sector, by SMF size-class, and by the market orientation of the outsourcing establishment (Chandra, 1992). Third, the impact of producer-service linkages is closely conditioned by the types of input-needs that are externalized (Phillips, D., 1992). These three factors add up to a complex picture of client demand that defies easy categorization, rendering normative modeling rather difficult.

To date, however, the triad of factors outlined above has received little attention in the literature on industrial geography. At this stage, in fact, the contemporary journals are imbued with general reviews, positional statements, and/or cries for more research, leaving the empirical component sparsely documented. To redress this situation, the following section adds an empirical dimension to ongoing work on the role of producer-service inputs in SMF development. On the producer-services side, attention is restricted to scientific, technical, and/or management inputs that directly serve the production or export-marketing efforts of SMF's. While this is a narrow definition of the producer services by almost any yardstick, the intent is to capture service categories that are likely to be of importance to the production and/or marketing efforts of industrial users.

Producer-Service Linkages of Upstate New York SMF's

A postal survey of 146 western New York SMF's in six local sectors revealed a series of connections between various measures of SMF business performance (exports, turnover, profits) and the presence of backward links to consultants outside manufacturing (MacPherson, 1992). The overall purpose of the survey was to assess the scale, purpose, and impact of service-to-SMF linkages. On the manufacturing side, attention was restricted to single-plant firms with fewer than 200 employees. On the input side, attention was focused upon the scientific, technical, and professional categories listed in table 1. The six sectors selected for the study are: textiles, furniture, metal fabricating, industrial machinery, electrical products, and scientific instruments. A total of 146 returns were received after two mailings, giving a final response rate of 48 percent. While only a snapshot of the findings can be presented here, four sets of results merit special mention. First, firms with extensive links to a wide mix of service specialists were found to exhibit superior performance across a range of output variables, including frequency of new product development, recent sales turnover, export growth, and successful process innovation. Significantly, firms that combined new product development with process innovations achieved the best performance, by far, over the period of 1986-90. This particular cluster of SMF's also emerged as the most intensive user-group in terms of producer-service contact. Second, major sectoral variations emerged in terms of the types of services obtained, suggesting, in this case, a product-cycle effect on the demand side. Third, noticeable sectoral differences were uncovered in terms of outsourcing motives. And, finally, external linkage arrangements were found to exhibit spatial patterns that varied significantly among SMF's of different sizes, performance categories, and product characteristics. These four sets of findings are discussed below.

Producer-Service Linkages and SMF Performance

Of the 146 firms that participated in the survey, 53.4 percent, or 78 firms, were found to consume external services on a recurrent basis (table 1). On average, externally-linked firms spent approximately $40,000 per year on specialized service inputs, and more than half of the respondents expected their future service consumption to increase. Significantly, frequent service

users were found to exhibit higher innovation propensities than nonusers, and a similar relationship was uncovered for export participation, inhouse research and development (R&D) activity, and sales growth (high versus low). Of the 78 service-linked firms, for example, almost 80 percent introduced new or substantially improved products over the 1986-90 period, compared with only 19 percent for non-service-linked firms. Overall, service-linked firms were found to significantly outperform their nonlinked counterparts across a wide range of variables, including new product development, process innovation, export success, and growth of sales (tables 2 and 3). These data suggest a plausible connection between recourse to external expertise and SMF performance, adding extra weight to some of the earlier findings reported by other scholars (Carter and Williams, 1957; Myers and Marquis, 1969; Rothwell, 1976). In this regard, then, the findings are not too surprising.

A further feature of tables 2 and 3 is that certain types of external linkages correlate positively with company performance, whereas others do not. For example, the incidence of successful process innovation is positively associated with backward links to production-engineering specialists; new product development correlates with links to university departments, industrial design companies, testing laboratories, and private R&D consultants; whereas the combined incidence of product and process innovation correlates with over half of the service categories listed in table 2. On the performance front, moreover, certain types of services stand out as being more strongly associated with SMF business success than others (table 3). For instance, growth of value-added over 1986-90 correlates positively with external links to production-engineering specialists, industrial design companies, and R&D services, whereas export growth is associated with links to university departments, management consultants, R&D inputs, and database vendors. While few of the rank-order correlations are strong, the findings suggest logical connections between particular classes of producer service consumption and the market and innovation characteristics of the survey firms.

Table 1--General characteristics of the six-sector sample

				Number and percent of firms with:									
	Response		Size	New prods.		New proc.		Exports		R & D		PS links	
Sector	N	%	jobs	N	%	N	%	N	%	N	%	N	%
Instruments	33	66.0	31.6	18	54.5	10	30.3	15	45.4	18	54.5	24	72.7
Electrical	26	52.0	53.7	13	50.0	8	30.7	12	46.1	16	61.5	16	61.5
Machinery	21	42.0	60.9	11	52.3	9	42.8	10	47.6	13	61.9	13	61.9
Furniture	18	36.0	26.2	6	33.3	12	66.6	6	33.3	3	16.6	8	44.4
Textiles	17	34.0	21.8	3	17.6	13	76.4	3	17.6	4	23.5	5	29.4
Metal fab.	31	62.0	39.4	8	25.8	19	61.2	8	25.8	8	25.8	12	38.7
Total	146	48.6	41.7	59	40.4	71	48.6	54	36.9	62	42.4	78	53.4

Table 1--General characteristics of the six-sector sample, continued

	Size distribution of establishments (number of employees)									
	0-19		20-49		50-99		100+		Total[1]	
Sector	N	%	N	%	N	%	N	%	N	%
Instruments	12	36.3	8	24.2	9	27.2	4	12.1	33	100
Electrical	5	19.2	3	11.5	11	42.3	7	26.9	26	100
Machinery	5	23.8	2	9.5	8	38.1	6	28.6	21	100
Furniture	7	38.9	5	27.8	4	22.2	2	11.1	18	100
Textiles	6	35.3	6	35.3	4	23.5	1	5.9	17	100
Metal fab.	11	35.4	10	32.2	7	22.5	3	9.7	31	100
Total	46	31.5	34	23.3	43	29.4	23	15.8	146	100

[1] Percentages may not sum to 100 percent due to rounding.

Table 2--External technical linkages and SMF innovation: rank-order correlations

Innovation mode Service category[1]	Product[2]	Process[3]	Multimode[4]	R & D[5]
University/college	0.471*	0.211	0.347*	0.499*
Government services	0.089	-0.117	0.121	-0.181
Management consultants	0.078	0.209	0.213	0.321*
Production-engineering	-0.147	0.347*	0.315*	0.336*
Industrial design	0.421*	-0.165	0.378*	0.338*
Testing laboratories	0.489*	0.191	0.291*	0.234*
R & D services	0.476*	0.203	0.341*	0.689*
Database/computer	0.198	-0.178	-0.081	0.221*
Other technical	-0.098	0.169	-0.128	0.177
All services	0.529*	0.392*	0.592*	0.587*

* = Significant at p = 0.05 or better.
[1] Services categories are based on frequency of external contact (jobs per year, 1986-90).
[2] Frequency of successful product development (1986-90).
[3] Frequency of successful process innovation (1986-90).
[4] Incidence of product + process innovation (1989-90).
[5] Presence of an inhouse R&D capability (at least one full-time R&D officer, 1990).

Table 3--External technical linkages and SMF performance: rank-order correlation

Performance Service categories[1]	VA[2]	Exports[3]	Sales[4]	Profits[5]	Jobs[6]
University/college	0.198	0.317*	0.189	0.201	0.153
Government services	-0.122	0.134	-0.112	-0.156	0.276*
Management consultants	0.143	0.321*	0.326*	0.289*	0.109
Production-engineering	0.289*	0.195	0.136	0.159	-0.114
Industrial design	0.348*	0.205	0.199	0.118	0.085
Testing laboratories	-0.114	0.107	0.109	0.112	0.151
R & D services	0.278*	0.349*	0.189	0.179	-0.171
Database/computer	0.168	0.311*	0.319*	0.299*	0.119
Other technical	-0.124	-0.097	0.297*	0.157	0.108
All services	0.327*	0.464*	0.367*	0.334*	-0.273*

* = Significant at p = 0.05 or better.
[1] Service categories are based on the frequency of external contact (jobs per year, 1986-90).
[2] Average annual growth rate for value-added (1986-90).
[3] Average annual growth rate for exports (1986-90).
[4] Average annual growth rate for total sales (1986-90).
[5] Average annual growth rate for pretax profits (1986-90).
[6] Average annual growth rate for employment (1986-90).

Sectoral and Spatial Variations in User Patterns

Recent service utilization patterns for the six sectors are summarized in table 4. Several points of interest can be discerned here. First, the most intensive users of external services are clustered within the scientific instruments, electrical equipment, and industrial machinery sectors. In terms of contact expenditures, SMF's in these three groups spent an average of approximately $80,000 per annum on outside expertise, compared with an average of less than $15,000 for the remainder of the sample. Here, then, it is possible to view external service demand from a product-cycle perspective, in that SMF's in newer markets tend to spend more on outside expertise than comparably sized firms in the three late-cycle sectors. Second, SMF's in the newer industries tend to exploit external expertise for product-related purposes, whereas the remainder of the sample typically seeks outside support for process-related tasks. Third, the three newer industries are proportionately more likely to obtain significant benefits from their external contacts.

Overall, roughly half of the technical services consumed by the survey firms were sourced from within the western New York region; 73 percent of the remainder was sourced from within New York State (NYS), a further 15 percent came from inside the United States but outside NYS, and 12 percent came from foreign sources (notably Toronto, Ontario). In this regard, table 5

indicates that certain classes of services are primarily obtained from local vendors, whereas others come mainly from nonlocal or remote suppliers. Nonlocal services of particular importance include inputs from management consultants (49 percent), industrial design specialists (69 percent), database/software services (57 percent), R&D support (67 percent), and production-engineering assistance (56 percent). Clearly, the western New York area is far from self-contained as far as producer service supply is concerned. Fully 54 percent of the sample's service expenditures go toward nonlocal suppliers, suggesting a substantial leakage effect on the purchasing side. The primary nonlocal supply sources include, in descending rank order, New York City, Toronto, Detroit, and Chicago. Smaller cities were generally insignificant in aggregate terms, though several were highly important to particular firms (for example, Rochester, New York, for photographic/optical services; Albany, New York, for State Government/administrative services; and Hamilton, Ontario, for metallurgical testing services).

Table 4--External linkage arrangements among the survey firms

		Impact[2]			Main function[3]			Gains[4]		Contact	x cost
Sector	Links[1]	H	M	L	Prod.	Proc.	Mgm.	Yes	No	Freq.	per job
Instruments	24	16	5	3	15	3	6	19	5	4.3	$29,500
Electrical	16	10	4	2	12	1	3	12	4	3.6	$26,200
Machinery	13	7	4	2	7	4	2	9	4	3.9	$19,600
Furniture	8	3	2	3	1	5	2	4	4	1.9	$11,000
Textiles	5	1	2	3	0	4	1	2	3	0.7	$3,400
Metal fab.	12	6	4	2	2	6	4	8	4	5.8	$5,300
Total	78	43	21	15	37	23	18	54	24	2.7	$15,800

[1] Number of firms with backward links to producer service units.
[2] Is measured along a multipoint attitude scales; where H = high and very important; M = medium and moderately important; and L = low and unimportant.
[3] Prod = product development; proc = process development; mgm = management support.
[4] A "yes" response indicated that the firm perceived its external links to contribute significantly to one or more of the performance variables listed in table 3.
[5] These data are rough estimates based upon average linkage per year (1986-90).

Table 5--Nonlocal service sourcing among service users

Service categories	Percent nonlocal	New York State[1]	Other U.S.[2]	Foreign[3]
University/college	32	85	4	11
Government services	38	90	10	0
Management consultants	49	78	9	13
Production-engineering	56	67	11	22
Industrial design	69	61	6	33
Testing laboratories	19	90	9	1
R & D services	67	84	9	7
Database/computer	57	72	10	18
Other technical	36	68	12	20
All services	54	73	15	12

[1] Outside western New York, but inside New York State.
[2] Outside New York State, but inside United States.
[3] Foreign sources, primarily southern Ontario.

Outsourcing Motives

Data presented earlier (table 3) indicate that local SMF's obtain external services to assist in-house efforts with regard to three major areas: (1) product development (including design, testing, and research support); (2) process improvement (assistance with the introduction and/or development of new manufacturing methods); and/or (3) management support (including marketing information, database development, and strategic planning, among other things). While table 3 provides a rough indication of the distribution of functions that are sought, these data say nothing about the motives that drive the decision to obtain external help. In this regard, personal interviews with 34 externally linked firms revealed a number of motives that warrant consideration. To begin with, 14 firms indicated that their inhouse resources were inadequate for the task. Here, all 14 respondents indicated that greater inhouse capability was not a feasible or desired option, if only because of the infrequent and/or project-specific nature of the input need. Second, 11 firms stated that their inhouse resources were sufficiently developed to accommodate the required input need. Significantly, all of the firms in this category opted for external assistance in order to focus their inhouse resources on more important tasks. Third, nine firms indicated that the decision to exploit external expertise was purely exploratory. To some extent, then, it would appear that some firms solicit external help in the hope that such help will be useful. Interestingly, this better safe than sorry attitude was particularly evident among larger SMF's with above average expenditures on inhouse R&D.

Overall, the results of the follow up interviews revealed that external inputs can assist the commercial performance of SMF's in a variety of ways. For example, several local firms in the

medical equipment sector periodically seek assistance from consultants that specialize in blending cosmetic aspects of industrial design with practical elements of ergonomics. Here, the typical goal is to transform internally conceived prototypes into products that will satisfy specialized customer needs. As a further example, several firms periodically hire production-engineering consultants in order to solve computerized numerically controlled (CNC), machine integration problems. While the list of anecdotes could be extended, the fundamental point is that most SMF's obtain external support in response to an internally perceived need for technical improvement. On this basis, virtually anything that promotes improved technical efficiency is likely to correlate positively with such output measures as sales growth, export success, or new products launched. In this sense, then, the relatively large number of significant correlations listed in tables 2 and 3 is not surprising.

Discussion

The picture rendered thus far evokes an image of competitive advantage for firms that exploit the producer-service environment. In this regard, the findings confirm and reinforce the empirical validity of several earlier studies. The data also suggest a spatial component to the networking relationship, giving a geographical context that merits reflection. Having said this, however, it is important to keep in mind that almost half of the survey firms have no backward links to specialists outside the manufacturing sector. Moreover, of the 78 SMF's that formally exploit external expertise on a periodic or recurrent basis, only 19 percent pursue this option using systematic procedures for input search, supplier evaluation, and/or needs assessment. Even so, the evidence on hand shows that progressive firms can obtain at least some of their technical input needs from geographically remote sources. This is not to deny that spatial proximity between suppliers and buyers is a major advantage. Rather, the intent is to suggest that certain types of firms can partially neutralize the consequences of peripheral location by accessing mobile expertise. Stretching this logic one step further, it is possible to envision successful SMF development in locations that are far removed from the agglomerated networks of information-exchange that characterize large metropolitan centers. On this note, the remainder of this paper explores options for policy development from the perspective of regions that contain weak supplies of service-sector talent.

Since specialized human capital is overwhelmingly concentrated in large metropolitan areas, SMF's in poorly endowed regions are left with only three options as far as input retrieval is concerned: (1) go without; (2) attempt to generate inhouse substitutes; or (3) import what is needed. Evidence reported in a number of previous studies suggests that the first option typically results in relatively weak SMF performance over the long run (Britton, 1991; Chandra, 1992; MacPherson, 1992; Rothwell, 1976, 1977, 1989). Although this proposition may not apply to firms that contain well-developed internal skills (Oakey, 1984), Rothwell's (1976) analysis of competitively matched pairs of firms in the United Kingdom and Western Europe (Project SAPPHO) shows that to go without is a serious mistake. The results of Project SAPPHO also show that the second option is almost as bad. Specifically, SMF's that attempt to generate a full range of inhouse capabilities typically encounter internal diseconomies of scope, many of which ultimately result in an inefficient use of scarce personnel (Rothwell, 1977). It should also be mentioned that some of the producer-service inputs that are purchased by SMF's come in the form of unique bundles of knowledge that cannot be assembled as part of an external substitution strategy (Harrington et al., 1991). While the third option (import what is needed) is a more

reasonable proposition in many cases, the balance of empirical evidence suggests that very small SMF's typically lack the internal resources that are required to identify, evaluate, and obtain specialized services from geographically remote sources. Moreover, partial evidence from a recent Buffalo survey suggests that the problem of long-distance input retrieval may also apply to larger SMF's in mature industries (Chandra, 1992). At this juncture, then, it is appropriate to synthesize the various strands of thinking outlined above. What are the options for SMF development in nonmetropolitan areas?

At one extreme, certain types of competitive SMF's exhibit minimal service needs. Firms of this ilk typically contain substantial inhouse resources on the technical side (Oakey et al., 1987). Within this category, SMF's that produce high-value/finished products for export markets ought to be coveted by policy agencies in remote, nonmetropolitan, and/or rural locations. In this regard, evidence from Phillips et al. (1991) suggests that rural areas can indeed nurture firms of this ilk, provided that an appropriate labor supply is available. This line of thinking runs contrary to the locational logic of the product cycle, in that rural areas are traditionally seen as targets for mature companies that require low-cost environments. According to Phillips et al. (1991), however, U.S. rural areas over the 1980's were proportionately just as successful as metropolitan regions in terms of their relative ability to support high-technology startups.

While it is conceivable that young firms may require access to external expertise during their early stages of growth, nonmetropolitan areas might be able to smooth the accessibility problem by providing company-specific import subsidies, information brokerage services, and/or electronic links to external vendors (Britton, 1991). To date, however, scant research has been carried out on the public policy options for SMF information support. Evidence from the western New York survey suggests that at least half of the external service demand generated by local SMF's is satisfied by importable inputs that can be delivered via telecommunications. On this note, then, a prime consideration for rural industrialization must surely be the quality, reliability, and depth of the local telecommunications infrastructure (Hepworth, 1989). A further option for rural SMF development concerns mature firms that traditionally exhibit minimal service demand. The logic here is that SMF's in late-cycle industries often require low-cost environments in terms of basic factor prices as well as relatively unskilled labor. The limiting factor in this option is that SMF's in mature sectors are often part of a supply chain that is dominated by a small number of larger companies. If the latter are located in metropolitan areas (which is usually the case), then a rural supply base would geographically extend the supply chain. Such an extension would surely lead to additional costs on the logistics side, such that the advantages of low factor prices at the local scale might be eroded by distributional inefficiencies over the long run. Clearly, then, a focus upon finished products rather than intermediate goods would seem appropriate.

All told, however, prospects for rural industrialization based upon networks of service-linked SMF's appear modest at best. The evidence on hand suggests that SMF's in cities like Buffalo have difficulty finding and exploiting external support, and these problems also exist (though to a somewhat lesser extent) in larger centers like Toronto (MacPherson, 1991). In this regard, at least two additional factors operate against the interests of SMF's in nonmetropolitan areas. First, lack of direct exposure to a locally rooted supply of services can be a problem in itself, if only because potential users are denied the opportunity to experiment with a range of external options. Second, certain classes of service imports necessarily involve time lags between needs-identification and input delivery. For example, engineering specialists that repair, troubleshoot, or

calibrate intricate aspects of a firm's CNC production line cannot be instantly available on demand. The cost of delivery delay is downtime.

Even if service accessibility and potential delivery delay were trivial issues (which they are not), other aspects of factor supply must also be considered. The availability of educated or skilled labor is a major case in point, while access to a basic research infrastructure is another (Malecki, 1991). To an extent, then, it would appear that successful SMF development in nonmetropolitan settings requires a particular type of firm, not just any firm. Can the firm withstand input delay? Can the firm operate efficiently with the available labor pool? Can the firm function without the need for extensive and frequent face-to-face contact with distant suppliers, customers, and/or other business partners? These sorts of questions suggest a need for comparative research on the organizational and commercial differences between urban versus rural SMF's in comparable sectors, size classes, and markets.

Epilogue

Evidence presented earlier suggests a series of connections between SMF innovation, market performance, and selective recourse to outside sources of scientific, technical, and management expertise. The evidence also suggests that service imports can partially compensate for supply-side deficiencies at the local scale. Clearly, then, it is possible for SMF's in nonmetropolitan areas to access the same range of technical services that are available to comparable firms in major cities. And, since virtually all classes of producer services are importable (either directly or indirectly), it follows that SMF's in rural settings may not always be substantially disadvantaged when it comes to technical input retrieval. A significant caveat here is that remote location adds extra transactions costs to the linkage function, rather like the logistics costs that must be absorbed by importers of intermediate goods. At the same time, moreover, the evidence also suggests that smaller SMF's are less well positioned to import their needs than larger firms. One possible remedy to this problem might be to create temporary import subsidies, guided by a public system of information brokerage. This option has already been developed in the United Kingdom. In principle, then, the technical and public policy infrastructure that is required to create equalized access to external expertise is not beyond reach.

From a rural economic perspective, however, it is unlikely that equalized access to producer services would be sufficient, in itself, to counterbalance other problems of factor supply. On the human capital side, for example, there is already evidence that large U.S. cities are beginning to encounter serious labor shortages, notably in such highly skilled occupations as toolmaking, turning, and precision welding. At present, then, the conjecture that rural SMF's enjoy relatively weak access to technical expertise is compounded by a broader range of difficulties, many of which are surely more important than the narrower question of service accessibility. This is not to suggest that SMF development is impossible outside the core cities of metropolitan regions. Rather, the intent is to suggest that policies to support rural industrialization must be focused upon a particular subset of SMF's. The task of identifying optimal subsets for nonmetropolitan regions of different types remains to be undertaken.

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The Role of Producer Services in Modern Production Systems: Implications for Rural Development

William J. Coffey[1]

Introduction

One of the major phenomena marking the economies of developed countries in the latter half of the 20th century has been the growth of service industries. The provision of services has replaced the production of goods as the principal form of economic activity in these countries, where service industries currently account for between 60 and 75 percent of total employment and generally more than 50 percent of total economic production (gross national or domestic product). In addition, the growth of services, whether measured in employment or in output, has been very rapid over the last two decades, accounting for approximately three-quarters of all new jobs created. These trends are indicative of a long-term structural evolution that is fundamentally modifying the production systems of advanced economies. Further, such trends may have considerable impact upon present patterns of uneven, spatial, economic development that characterize all developed nations. For example, a widely held view suggests that service industry growth will ultimately aid in the solution of the longstanding economic development problems of lagging (principally nonmetropolitan) regions. At the root of this optimism is the perception of services as relatively footloose; that is, as being free of the locational constraints that have made such regions relatively unattractive to investment in more traditional economic activities such as manufacturing.

Using empirical evidence from the Canadian context, this paper explores a number of issues related to the role of service industries in economic development, with particular emphasis upon the implications of the growth of producer services for nonmetropolitan areas. In theory, producer services have the potential to contribute to the economic development of nonmetropolitan areas in two ways: first, in their own right, as important sources of job creation and exports, and second, through their ability to improve levels of output, innovation, and productivity in manufacturing activities.

The following section makes the distinction between different classes of services, and emphasizes the role of tradeable services in the growth of a local economy. Next, the relation between producer services and the primary and manufacturing sectors is examined. The fourth section summarizes the locational dynamics of a set of aggregated economic sectors in Canada for 1971-81. Finally, implications of the above topics for the economic development of nonmetropolitan areas are explored.

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The Role of Tradeable Services in Economic Development[2]

Perhaps the principal attribute of "the service sector" is its vast degree of heterogeneity. In fact, the very notion of a service sector represents a profound ecological fallacy. Different service activities are characterized by different rates of growth, by different levels of capital and human resource utilization, and by different growth stimuli and growth constraints. In addition, in the service sector, one finds part-time, intellectually unrewarding, and poorly paid positions juxtaposed with stimulating and highly remunerative employment; "the service sector" represents one of the most concrete examples of a dual labor market. The notion of the rise of the service sector as a monolithic shift within the economy is thus an unwarranted simplification.

Most national accounting frameworks allocate to the service sector all activities not included in the three goods-producing sectors: primary activities (agriculture, fishing, mining, and so forth), manufacturing, and construction. A wide range of specific typologies can be employed to distinguish between similar types of service activities. For example, it is common to differentiate distributive services, such as wholesale and retail trade, communications, transportation, and public utilities; producer services, such as accounting, legal counsel, management consulting, and financial services; consumer services, such as restaurants, hotels, beauty salons, and dry cleaners; not-for-profit services, such as health, education, and religion; and government services, such as public administration and defense.

It is the set of activities referred to as producer services, those intermediate demand functions that serve as inputs into the production of goods or of other services (and that, as such, are perhaps more correctly characterized as indirect elements of the production process), that have the greatest potential for stimulating the economic development of a local economy. There are four reasons why this is so. The first three are directly related to the inherent nature of producer services themselves, while the fourth involves the linkages between producer services and other economic activities.

First, producer services comprise the most rapidly growing sector in the majority of developed economies. In Canada, over the period 1971-81, employment in producer services experienced a growth rate of 141.2 percent, nearly twice that of its closest competitor, the finance, insurance, and real estate (FIRE) sector (Coffey and McRae, 1989). In the United States, 25 percent of GNP now originates from producer services alone, the equivalent of GNP resulting from the physical production of goods (Noyelle and Stanback, 1984). This increased demand for producer services, in turn, is a function of the changing organizational structure of goods producing activities, and of the enhanced role of product innovation and of market differentiation. Certain authors (for example, Gershuny and Miles, 1983; McRae, 1985) have argued that the observed growth of producer services is largely a statistical artifact, due to a displacement effect by which previously internalized functions are contracted out to external producer-service firms. A number of recent studies (for example, Beyers, 1989; Tschetter, 1987; Kutscher, 1988), however, have empirically refuted this argument, demonstrating not only that producer-service growth is real, but

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[2] The terms "producer services" and "tradeable services" will be used interchangeably in this paper since the vast majority of tradeable services are found within the producer-services group. In addition, producer services also may be considered to include the head (or divisional) office functions of firms in any sector of activity; the principal task of a head office is, precisely, to provide a range of producer-service functions to a captive internal market.

that output and employment growth, simultaneously, have been achieved in internal and external producer services.

Second, producer services can constitute an important element of the economic base of a region. Economic base theory posits that a region's economic base has two principal elements. They are: basic or export-oriented activities and nonbasic or residentiary activities, which serve the local population. There is obviously an overlap between the two; many specific activities can serve both functions. According to the theory, it is the former set of activities that serve a propulsive or engine-of-growth function. They create injections into the local economy that, through the multiplier mechanism and the circular flow of income, stimulate local economic growth. For many years, services had been viewed in the framework of the traditional Fisher-Clark typology of economic activity, which relegated them to a residual category composed of nonproductive activities. Consequently, all services had long been regarded as residentiary activities. It is now widely recognized, however, that a significant proportion of producer services, in particular, must be regarded as basic activity in that they are not only exportable, tradeable, but also highly responsive to external demand. Producer services have emerged as one of the fastest growing components of both interregional and international trade. Canadian-based consulting and professional services, alone, accounted for $987 million worth of international exports in 1985, representing a twenty-four-fold increase over the 1969 value (Statistics Canada, 1988). Further, at the beginning of this decade, legal services established themselves as the principal export of the New York City economy (Ginzberg and Vojta, 1981). Export-oriented business and corporate services grew at an annual rate of 10.1 percent between 1977 and 1986, attaining a total of over $50 billion in 1986, and accounting for approximately two-thirds of New York City's export earnings (Drennan, 1987).

Third, it follows from the previous point that producer services may be characterized by a spatial distribution that is significantly different from that of the range of residentiary (principally consumer) services. The distribution of residentiary services clearly follows population patterns (Marquand, 1983; Coffey and McRae, 1989). Due to their potential tradeability, producer services do not necessarily face the same constraint of physical proximity to their market. In theory, the less populated nonmetropolitan regions may be able to develop export-oriented producer services.

Fourth, and perhaps most important, through their role in investment, innovation, and technological change, producer services may contribute to spatial variation in the economic development process (Marshall, 1988). They may be regarded as playing a strategic role ("the locus of competitive advantage," according to Walker, 1985) within production systems where they constitute one part of the overall division of labor. The key position that producer services occupy is essentially based upon the contribution that they can make to promoting or facilitating overall economic change and adaption. In an age of rapid technological change, certain producer services provide the source and mediators of that change (Marquand, 1983). Marshall et al. (1985) argue that producer services are an important part of an economy's supply capacity. They influence its adjustment in response to changing economic circumstances and they may help to adapt skills, attitudes, products, and processes to changes, or to reduce the structural, organizational, managerial, and informational barriers to adjustment.

In concluding this examination of the role of producer services in regional economic development, one must stress two points. First, all services are not created equal. Certain types of services lead

economic growth and other services follow from growth in other sectors. Second, the ability of producer services, or of any other element of the economy, to influence the level of economic development in a region is a function of the definition of development employed. If development is defined modestly in terms of incremental job creation, it may well be that public sector functions or consumer services (demand for which, in lagging regions, is largely financed by transfer payments) will be as effective an instrument as producer services. On the other hand, if development is measured in a more rigorous manner, involving considerations of structural change, productivity increase, market-earned income, and so forth, producer services stand alone among service activities as a possible focus for policy intervention.

The Interdependence of Goods Production and Service Production

There are two contrasting schools of thought concerning the increase of service activity (whether measured by employment or by output) in developed countries. We may characterize the first perspective as one of deindustrialization, viewing these trends as highly negative, and emphasizing the loss of goods-producing activities to newly industrializing countries. Under the second perspective, we view the relative shift of activity out of manufacturing and toward services as a natural evolution of advanced productive systems, as a natural evolution in the way in which we produce. This latter school of thought appears to be more realistic than the former given that, in absolute terms, developed countries are producing more manufactured goods than ever before. Table 1 demonstrates that, in spite of manufacturing's declining importance in Canada in terms of its relative share of both GDP and total labor force, its growth has continued in absolute terms, albeit at a rate inferior to that of services.

Table 1--Share of manufacturing and services in the Canadian economy, 1961-86

	Share of GDP		Share of labor force		
Year	Manufacturing	Services[1]	Manufacturing	All services	Community, business, and personal services
	Percent				
1961	19.6	36.2	21.6	55.3	19.6
1971	20.2	37.3	19.8	57.7	23.7
1981	19.3	42.3	18.5	65.0	28.3
1986	19.2	43.8	16.9	67.6	31.0
Growth rate, 1961-86[2]	184.0	251.0	66.5	141.3	212.5

[1] Services produced by the business sector.
[2] Growth rate of GDP contribution in constant dollars, and of persons in the labor force.

Source: Calculated from *Statistics Canada*, Catalog No. 11-210 (Tables 1.15 and 1.16) and Catalog No. 93-152 (Table 1).

The process that is occurring in manufacturing is comparable to the historical evolution of agricultural production in developed countries; we are producing an increasing volume with a decreasing proportion of the labor force. The notion that we have become a postindustrial society is not strictly accurate. To paraphrase Mark Twain, reports of the demise of manufacturing activity have been greatly exaggerated.

The interdependence between goods production and service rendering manifests itself in two major ways. First, there is an increasing complementarity between goods and services. The modern economies of developed countries are witnessing important transformations in what types of goods are produced and in how these goods are produced (Noyelle and Stanback, 1984).

In terms of what is produced, there has been a marked trend toward greater product differentiation as consumers are attracted to more stylized products and as producers target special groups of consumers. The design, marketing, and distribution aspects of goods production have thus become increasingly important. At the same time, many services closely related to consumption have come to the fore, such as maintenance, finance, and instruction. General Motors Acceptance Corporation (GMAC), for example, a division of one of the United States' largest manufacturers, was originally established to assist consumers in the purchase of their motor vehicles by providing credit. Now, GMAC has emerged as one of that country's largest financial establishments. The relation between computer hardware and software is also often cited as an example of this complementarity. Neither is able to function without its counterpart.

In terms of how goods are produced, there has been a marked tendency to substitute high-technology-embodied capital for labor in goods-producing processes (Stanback et al., 1981). This has allowed management's attention to be shifted away from physical production, where processes are increasingly routinized, towards other areas which previously had been regarded as deserving of only secondary priority, such as corporate and product planning, research and development, advertising and marketing, and administrative control. In addition, increases in the size and complexity of manufacturing firms and the proliferation of government regulation in many countries have necessitated the incorporation of more diversified and more advanced levels of management expertise.

Second, as Gershuny (1978) has noted, in the emerging self-service economy there has been a substitution effect through which manufactured goods operated by consumers have displaced certain consumer services. Washing machines and automobiles, for example, have been substituted for laundry and transportation services. At the same time, however, as previously noted, increasing service inputs have been required to market, distribute, and maintain these manufactured goods.

Nowhere is the interdependence between goods production and services more evident than in the case of the set of activities commonly referred to as producer services. From their origins as almost exclusively administrative functions in the 1950's (marketing, accounting, and advertising), producer services have more recently expanded in scope so as to include broader functions related to innovation, information, and control. The strategic role played by producer services within production systems is widely recognized, based upon the contribution that they can make to promoting or facilitating overall economic change and adaptation.

An establishment or firm has the choice of internalizing or externalizing its consumption of a given producer-service input. On the one hand, the necessary service function may be provided internally, by the organization's own employees. This practice is fairly widespread. In the Canadian goods-producing sectors, between 20 and 36 percent of employment involves a service function and, in certain subsectors, such as chemical production and petroleum refining, the figure increases to over 50 percent (Coffey and McRae, 1989). On the other hand, the establishment or firm may purchase the required input from a freestanding organization specializing in the production of such services. The possibility exists for a given firm or establishment to substitute between these two forms of factor inputs. The use of externalized inputs is largely a function of the degree of nonstandardization and the unpredictability of the demand for a particular service (Coffey and Polèse, 1987a), and of attempts to achieve a higher level of production flexibility and external economies of scale (Scott, 1988). Coffey and Bailly (1991) provide a detailed discussion of the factors which lead to externalization.

In sum, the relationship between goods production and services is an intimate one; service inputs are an integral part not only of the physical production process itself, but also of activities that are both upstream (for example, design and research and development) and downstream (for example, marketing, advertising). Rather than dividing an economy into goods production and services production activities, it is more desirable to conceptualize it in terms of an integrated production system, the specific elements of which represent individual points on the goods-services continuum. Further, as demonstrated in the following section, the specific position of an establishment along this continuum also has locational implications.

Canadian Locational Trends, 1971-81[3]

Some Empirical Evidence, 1981

In the second section of this report, the fundamental role played by tradeable services in the development of local and regional economies was identified. To evaluate the economic development prospects of nonmetropolitan areas, one must understand the locational dynamics of these activities. In particular, it is necessary to consider if tradeable services tend to centralize in major metropolitan areas, or if they have the capacity to decentralize to nonmetropolitan locations. Previous work (Coffey and Polèse, 1988; Coffey and McRae, 1989; Coffey, Fullum, and Polèse, 1989) on the location of economic activities in Canada helps to shed some light on these issues.

Sectoral and occupational employment data at a very disaggregated spatial scale are pooled into 10 synthetic (that is, noncontiguous) region types defined on the basis of two criteria: (1) population size, or position within the urban hierarchy, and (2) location relative to a major urban area. This classification system produces the 10 region types summarized in table 2. The terms "central" and "peripheral" designate municipal units or portions of census divisions that lie within (central) or beyond (peripheral) a 100-km radius of an urban area having a population of over 100,000 in 1981. The 100-km radius may be regarded as a realistic delineation of the zone of frequent economic contact between a city and its surrounding countryside. One of the principal

[3] The detailed data from the 1991 Census that are necessary in order to bring this analysis up to date are not yet available.

virtues of this analytical system is that it enables one to distinguish between true decentralization and deconcentration, which is the dispersion of activities within the urban fields of large centers or an extended form of suburbanization.

Table 2--Synthetic region types

Region type	Population	Relative location	No. of units
1	More than 300,000	---	10
2	100,001 - 300,000	---	16
3	50,001 - 100,000	Central	11
4	50,001 - 100,000	Peripheral	8
5	25,001 - 50,000	Central	19
6	25,001 - 50,000	Peripheral	20
7	10,001 - 25,000	Central	17
8	10,001 - 25,000	Peripheral	19
9	Fewer than 10,000	Central	127
10	Fewer than 10,000	Peripheral	127

Perhaps the most effective method of describing the concentration of economic activity across a set of regions, while controlling for the size differences of the latter, is by means of location quotients.[4] Table 3 presents location quotients for 15 aggregated sectors by synthetic region type.

It may be observed that primary activities and the traditional manufacturing sector (MFG1) tend to be concentrated at the lower end of the settlement hierarchy, intermediate manufacturing (MFG2) in 25,000-100,000 central regions and in 50,000-100,000 peripheral regions, and technical manufacturing (MFG3) in 25,000-100,000 central regions. Producer services and FIRE services are highly concentrated in the largest metropolitan areas and their spatial distribution is a direct function of position within the urban hierarchy. Note, in particular, the contrast in location quotient profiles between producer services and consumer services, the latter being far more evenly distributed. Figure 1 represents location quotient patterns for selected sectors of activity.

Tables 4 and 5 present alternative methods of measurement that reinforce this notion of the concentration of high-order services. Table 4 depicts the relationship between regional shares of population, total employment, and service and producer service employment. With the exception of the major metropolitan (300,000+) and rural (fewer than 10,000) categories, the shares of both total employment and service sector employment tend to closely correspond to regional

[4] The location quotient is an index of specialization that compares the spatial concentration of a given sector in a given region to that sector's level of concentration in a benchmark spatial unit, in this case the entire Canadian economy. Thus, a sector with the same level of concentration in a given region as in the national economy will have a value of 100. Values below 100 indicate a lower degree of concentration relative to the Canadian economy, while those above 100 indicate a higher degree of concentration.

population shares. In the case of the 300,000+ regions, total employment and, especially, service employment shares are significantly higher than the population share. For rural regions, the opposite is true. Only in the case of the 300,000+ category is the share of producer-service employment superior to that of service employment. In the case of the nine other region types, the percentage of producer service employment is considerably lower than that of service employment and this phenomenon is especially evident in the rural regions.

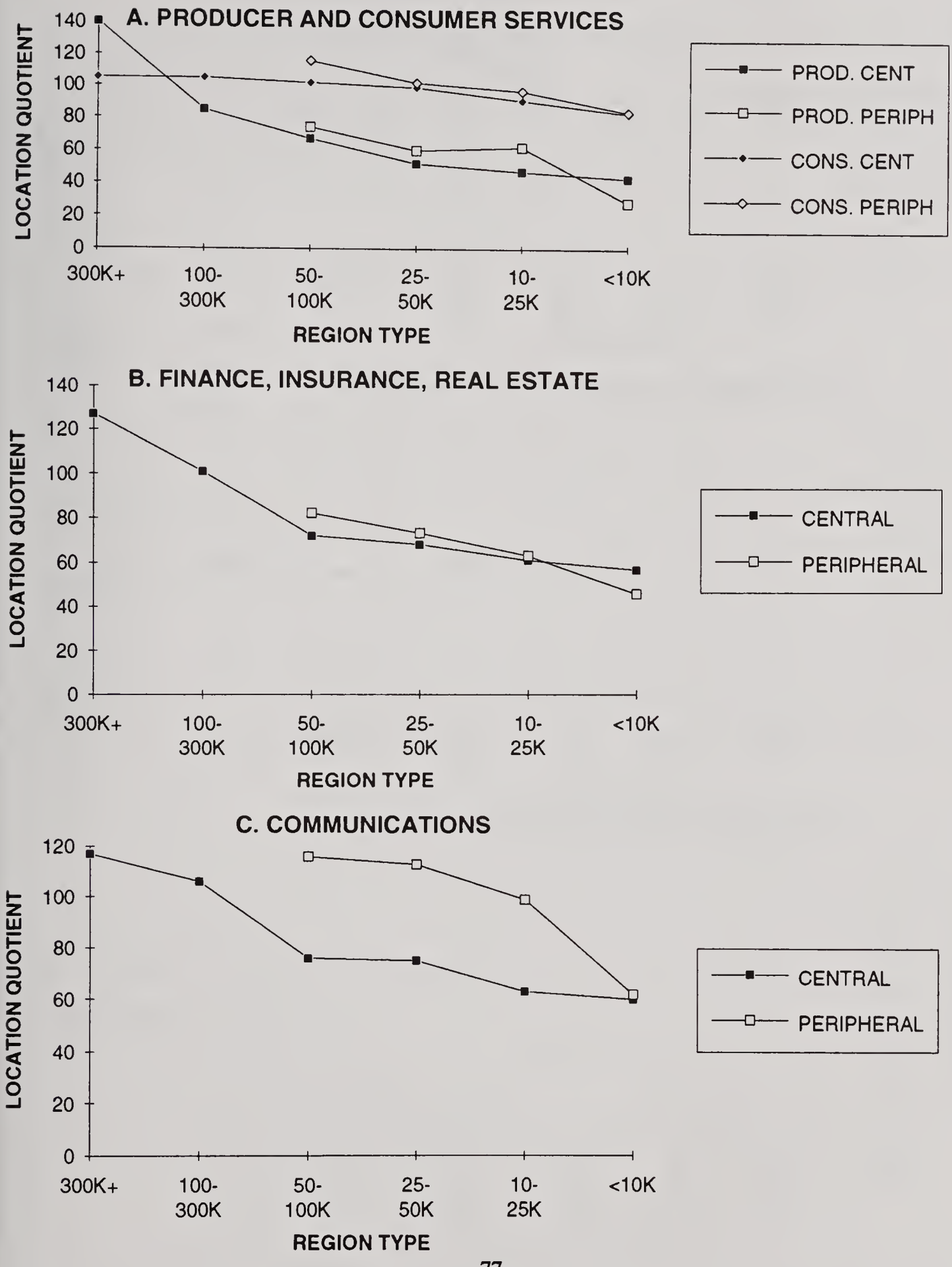
Table 3--Sectoral location quotients, synthetic region types, 1981

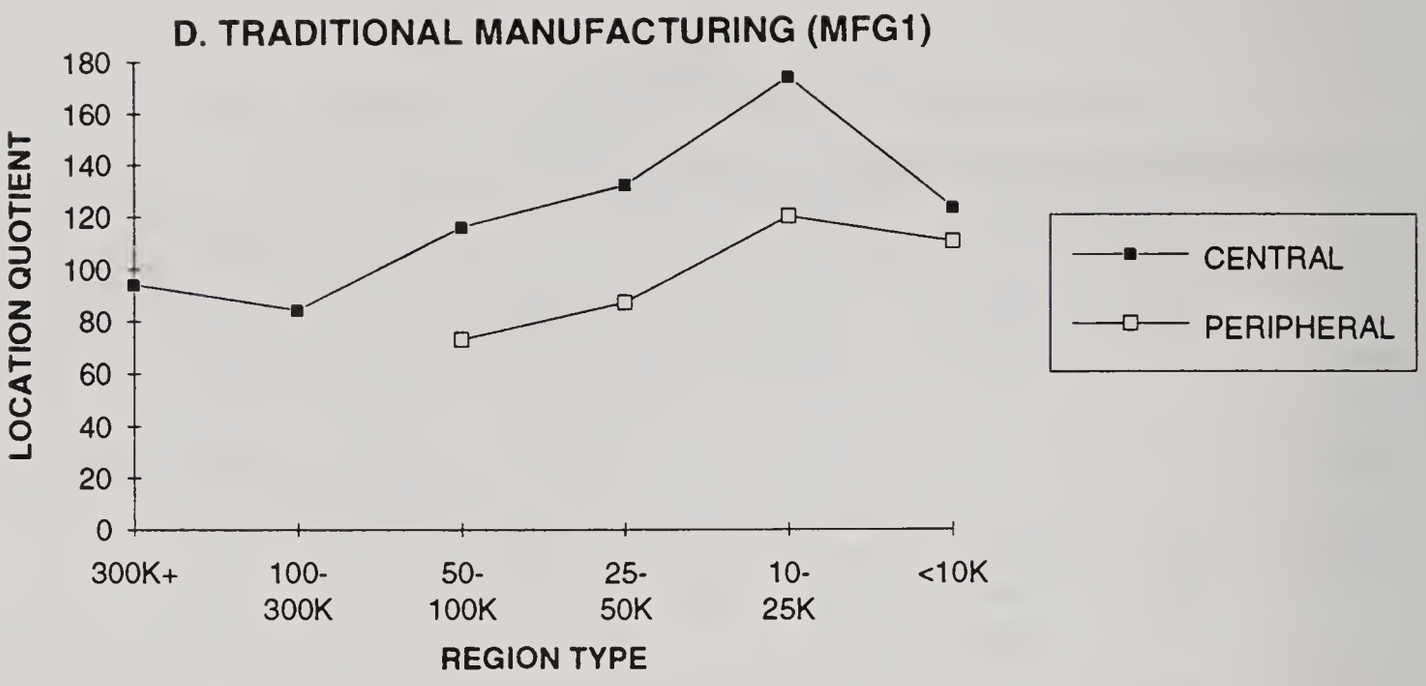
(In thousands)

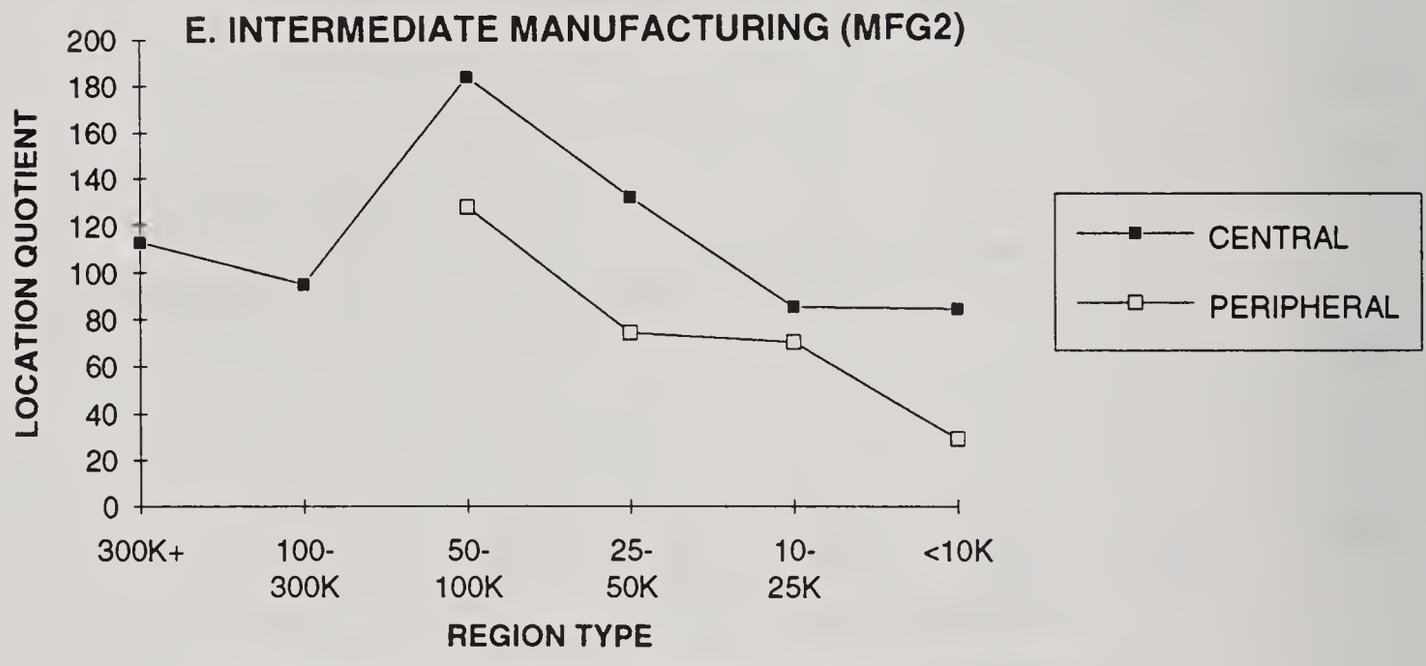
Sector	300+	100-300	50-100 C	50-100 P	25-50 C	25-50 P	10-25 C	10-25 P	<10 C	<10 P
Prim	27	43	43	60	68	145	114	167	278	371
Mfg1	94	84	116	73	132	87	174	120	123	110
Mfg2	113	95	184	128	132	74	85	70	84	29
Mfg3	111	148	142	31	157	59	94	14	79	18
Constr	95	92	95	122	89	116	79	81	123	112
Trans	107	84	64	134	76	95	64	96	94	103
Commun	117	106	76	116	75	113	63	99	60	62
Util	98	98	110	99	127	126	72	87	87	114
Whole	116	92	81	110	82	82	76	63	83	64
Retail	100	108	114	120	111	117	110	114	87	86
FIRE	127	101	72	82	68	73	61	63	57	46
Nonprof	97	123	106	104	110	110	109	116	85	93
Consum	105	105	102	116	99	102	91	97	83	84
Prod	140	85	67	74	52	60	47	62	43	28
Public	103	119	94	98	92	101	116	119	75	90

Table 5 presents a more detailed portrait of the metropolitan concentration of service employment in Canada, indicating precisely where the majority of service jobs, and producer-service jobs, in particular, are located. The 10 Census Metropolitan Areas (CMA's) presented in table 5 are the individual components of region type 1 (300,000+). We find, for example, that 50.1 percent of all Canadian service employment is located in the seven largest metropolitan centers. Producer-service employment is even more highly concentrated, with 53.5 percent found in the 3 largest centers and the 10 largest metropolitan centers account for 80 percent of all producer-service employment.

FIGURE 1
EMPLOYMENT LOCATION QUOTIENTS, CANADA 1981




D. TRADITIONAL MANUFACTURING (MFG1)
LOCATION QUOTIENT
180
160
140
120
100
80
60
40
20
0
300K+
100-300K
50-100K
25-50K
10-25K
<10K
REGION TYPE
CENTRAL
PERIPHERAL


E. INTERMEDIATE MANUFACTURING (MFG2)
LOCATION QUOTIENT
200
180
160
140
120
100
80
60
40
20
0
300K+
100-300K
50-100K
25-50K
10-25K
<10K
REGION TYPE
CENTRAL
PERIPHERAL

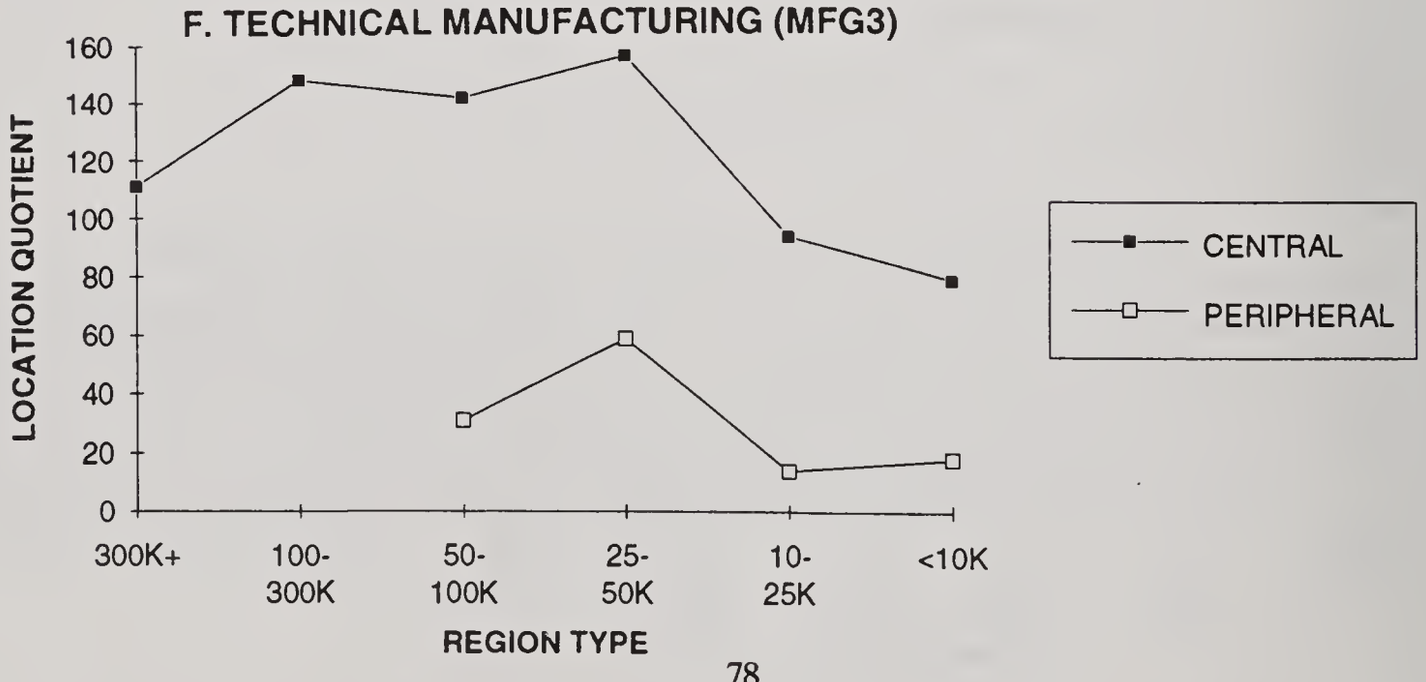

F. TECHNICAL MANUFACTURING (MFG3)
LOCATION QUOTIENT
160
140
120
100
80
60
40
20
0
300K+
100-300K
50-100K
25-50K
10-25K
<10K
REGION TYPE
CENTRAL
PERIPHERAL

Table 4--Population and employment shares, synthetic region types, 1981

(In thousands)

Item	300+	100-300	50-100 C	50-100 P	25-50 C	25-50 P	10-25 C	10-25 P	<10 C	<10 P
% of 1981 Canadian population	45.5	11.6	3.1	2.4	3.0	3.0	1.1	1.4	15.5	13.4
% of 1981 total emp	52.6	12.3	3.1	2.4	3.0	3.0	1.1	1.3	11.2	10.0
% of 1971-81 total emp increase	50.8	10.4	2.7	2.5	2.8	3.5	0.8	0.9	14.3	11.3
% of 1981 service emp	56.3	13.2	3.0	2.6	2.8	3.0	1.0	1.3	8.8	8.0
% of 1971-81 service emp increase	53.3	11.2	2.7	2.6	2.6	3.2	0.7	0.9	12.3	10.5
% of 1981 producer service emp	73.5	10.4	2.1	1.8	1.5	1.8	0.5	0.8	4.8	2.8
% of 1971-81 producer service emp increase	70.4	9.3	1.9	1.8	1.5	1.9	0.4	0.6	7.7	4.5

Table 5--Spatial concentration of producer-service employment in Canada, 1981

City	Population		All services		Producer services	
	Canada	Cumul.	Canada	Cumul.	Canada	Cumul.
	Percent					
Toronto	12.3	12.3	15.8	15.8	27.4	27.4
Montréal	11.6	23.9	12.8	28.6	16.1	43.5
Vancouver	5.2	29.1	6.8	35.4	10.0	53.5
Ottawa-Hull	3.0	32.1	4.4	39.8	5.2	58.7
Edmonton	2.7	34.8	3.8	43.6	5.0	63.7
Calgary	2.4	37.2	3.3	46.9	7.3	71.0
Winnipeg	2.4	39.6	3.2	50.1	2.8	73.8
Québec	2.4	42.0	2.9	53.0	2.2	76.0
Hamilton	2.2	44.2	2.2	55.2	2.3	78.3
St. Catharines	1.3	45.5	1.1	56.3	1.2	79.5

Summary of Major Trends, 1971-81

Tables 6, 7, and 8 portray changes in sectoral employment over the period 1971-81. Table 6 indicates that rural regions and smaller urban places experienced the highest growth rates across a number of sectors, especially producer services. It must be understood, as table 7 indicates, that these high-growth rates operated on a relatively restrained employment base and produced a modest level of absolute growth (for example, 20,000 and 11,000 new producer-service jobs for the rural central and peripheral areas, respectively). On the other hand, the 10 major metropolitan centers, in spite of relatively modest growth rates, experienced large absolute employment gains (179,000 new producer-service jobs). Figure 2 presents the relationship between growth rate and absolute growth in producer services. Table 8, which should be interpreted in conjunction with table 3, indicates relative changes in the degree of spatial concentration of economic sectors across the 10 region types. In almost all sectors, including producer services, the major metropolitan areas experienced declines in their level of service employment concentration relative to other region types, and to rural regions in particular. Figure 3 shows location quotient changes for producer services and technical manufacturing (MFG3).

The major changes that occurred over the 1971-81 period may be summarized in the following manner. First, there was a relative, but not absolute, shift in employment in most sectors away from the 300,000+ region type, and to a lesser extent, from the 100,000-300,000 and 50,000-100,000 central region types, toward the two rural region types. The extent of this change is,

Table 6--Growth rates by sector, synthetic region types, 1971-81

Sector	300+	100-300	50-100 C	50-100 P	25-50 C	25-50 P	10-25 C	10-25 P	<10 C	<10 P	Canada
	(In thousands)										
	Percent										
Goods	27.5	20.2	24.9	32.8	33.8	50.5	22.0	16.4	42.7	28.8	29.6
Prim	55.4	9.7	25.4	21.5	22.0	58.4	5.9	15.6	2.6	4.5	12.0
Mfg1	21.0	18.3	19.6	34.2	29.2	31.5	26.1	17.3	94.9	88.8	33.7
Mfg2	27.8	23.5	28.7	27.2	43.9	41.2	41.0	14.5	204.9	533.2	38.9
Mfg3	20.5	21.2	16.5	21.4	31.7	52.8	25.9	64.1	119.9	204.4	28.0
Constr	35.7	25.1	36.5	47.4	45.1	73.9	19.5	14.2	59.6	49.9	39.9
Services	54.1	45.9	49.3	57.1	51.1	66.3	39.8	35.5	108.3	94.5	59.0
Trans	33.3	22.1	27.7	21.8	32.1	24.6	24.0	10.1	97.3	70.9	38.6
Commun	56.0	50.7	48.8	48.2	54.4	59.1	25.3	25.8	150.2	88.1	59.9
Util	45.8	49.3	19.2	45.7	52.4	44.3	48.3	16.2	307.3	144.5	62.4
Whole	54.8	47.8	58.0	68.8	67.3	63.7	57.6	27.4	138.6	119.4	63.0
Retail	46.3	42.8	49.5	53.9	56.4	73.4	42.9	45.0	66.0	65.2	50.4
FIRE	67.5	64.9	68.7	87.6	75.9	111.7	62.8	61.8	253.4	313.2	79.4
Nonprof	44.8	40.0	39.5	53.0	43.0	57.8	34.6	34.5	84.2	80.6	49.9
Consum	69.3	65.6	71.5	86.6	69.4	87.5	56.7	45.2	113.3	97.1	74.8
Prod	127.8	110.6	112.1	143.1	107.6	169.6	104.2	70.7	1869.0	1540.5	141.2
Public	36.4	27.9	32.7	35.5	23.1	51.6	18.2	22.9	115.7	109.2	43.3
Total	45.8	37.8	39.5	49.6	44.3	60.8	32.5	28.5	71.5	57.7	48.2

Table 7--Absolute employment change by sector, synthetic region types, 1971-81

(In thousands)

Sector	300+	100-300	50-100 C	50-100 P	25-50 C	25-50 P	10-25 C	10-25 P	<10 C	<10 P	Canada
	1000's										
Goods	315	58	23	17	28	33	7	6	158	104	749
Prim	35	3	2	2	3	11	0.5	2	6	11	76
Mfg1	84	16	6	4	9	6	4	2	65	51	247
Mfg2	79	14	8	4	7	4	2	0.7	38	15	171
Mfg3	34	11	2	0.5	4	2	0.7	0.3	17	4	75
Contr	82	14	5	6	5	9	0.9	0.8	32	23	179
Services	1362	285	68	65	65	82	19	23	315	268	2553
Trans	70	9	2	3	3	3	0.6	0.6	26	21	137
Commun	50	10	2	2	2	3	0.3	0.6	9	7	85
Util	19	5	0.7	0.9	2	1	0.3	0.2	8	8	44
Whole	108	18	5	5	5	5	1	0.9	27	18	193
Retail	201	48	15	13	15	18	4	6	47	42	407
FIRE	154	28	5	5	5	7	1	2	26	20	253
Nonprof	239	66	15	13	15	18	5	6	66	63	505
Consum	229	52	14	13	12	15	4	4	50	42	435
Prod	179	24	5	5	3	5	1	1	20	11	254
Public	114	25	6	5	4	8	2	2	36	37	239
Total[1]	1677	343	92	82	93	115	26	29	473	372	3302
Goods emp growth per unit	34474	3598	2107	2106	1467	1637	435	320	1246	822	2002
Service emp growth per unit	136200	17813	6182	8125	3421	4100	1118	1211	2472	2110	6826

[1] Columns and rows may not equal the total due to rounding.

Table 8--Change in sectoral location quotients, synthetic region types, 1971-81[1]

(In thousands)

Sector	300+	100-300	50-100 C	50-100 P	25-50 C	25-50 P	10-25 C	10-25 P	<10 C	<10 P
Prim	8	2	7	4	7	34	6	27	-73	-52
Mfg1	-8	-4	-6	0	-1	-9	9	1	25	27
Mfg2	-8	-4	-3	-13	8	-5	10	-4	40	22
Mfg3	-5	3	-5	-2	8	5	9	5	26	10
Constr	-1	-4	3	5	5	15	-4	-5	-2	1
Trans	-2	-5	-1	-20	-2	-20	0	-9	18	14
Commun	-1	1	-1	-10	-1	-10	-9	-10	16	6
Util	-9	-1	-31	-12	-5	-28	2	-18	47	33
Whole	-4	-2	2	3	4	-7	6	-7	17	13
Retail	-1	2	6	2	7	7	6	11	-4	3
FIRE	-7	-1	0	3	0	6	1	2	24	25
Nonprof	-2	0	-1	1	-2	-3	0	4	5	11
Consum	-2	2	4	6	0	-1	0	-4	4	5
Prod	-6	-5	-5	0	-7	2	-3	-17	37	24
Public	-3	-5	-1	-7	-12	-3	-10	-1	17	24

[1] 1981LQ - 1971LQ.

FIGURE 2
GROWTH RATES VERSUS ABSOLUTE GROWTH
PRODUCER SERVICE EMPLOYMENT, 1971-81

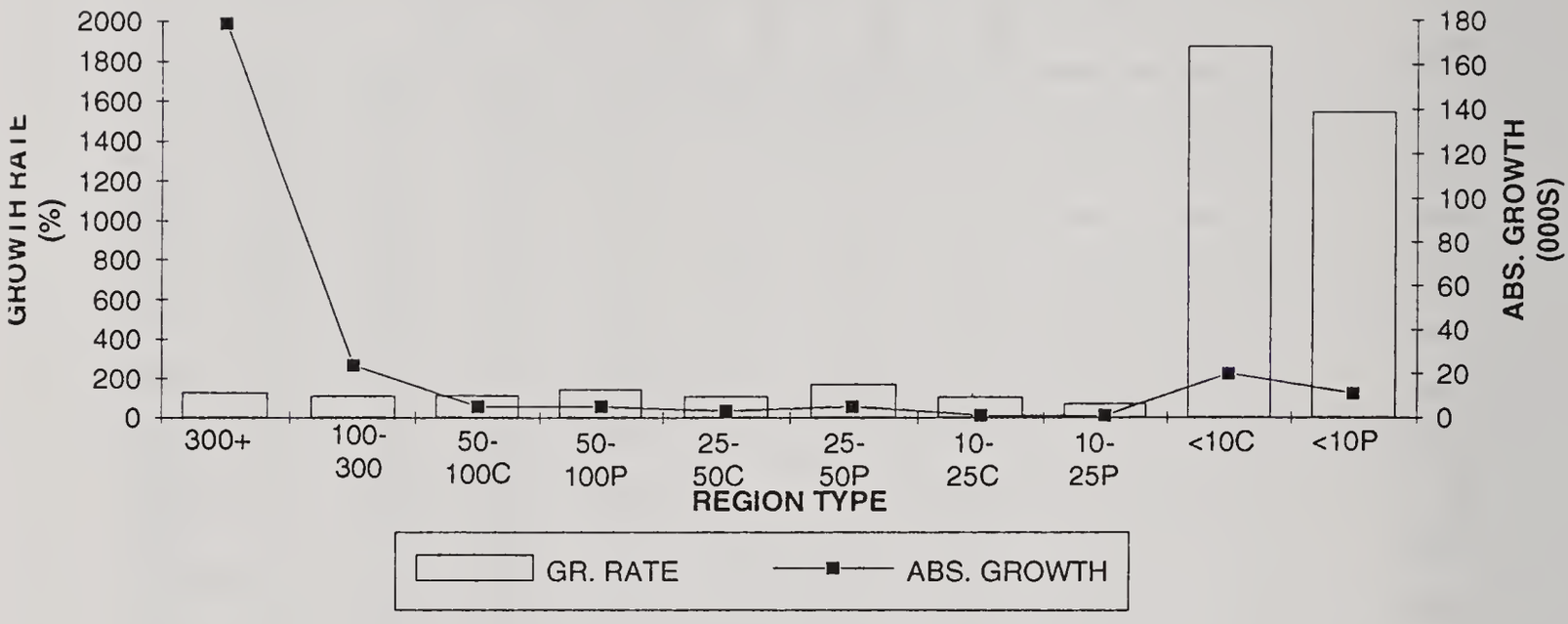
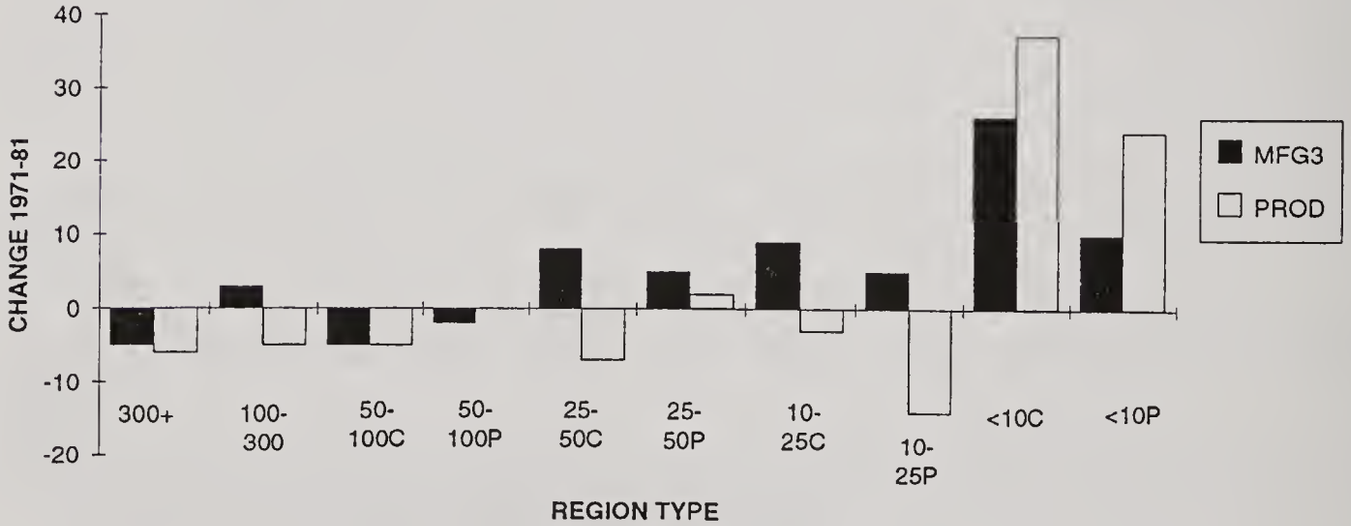


FIGURE 3
LOCATION QUOTIENT CHANGE, 1971-81,
PRODUCER SERVICES AND TECH. MANUFACTURING



however, insufficient to characterize it as a major urban-rural shift and the urban region types continue to dominate by all measures. Where service shifts away from large metropolitan areas have taken place, the data indicate that they involve primarily the types of routinized and standardized activities generally referred to as back office functions, for example, data processing, security services, and nonstrategic administrative tasks. The higher order front office functions, those involving strategic tasks or requiring face-to-face contact with clients, remained concentrated in the larger metropolitan centers (Coffey and McRae, 1989).

Second, of all of the employment growth that occurred outside of metropolitan areas (100,000+), 53.4 percent occurred in central region types, as opposed to 46.6 percent in peripheral region types. In the case of producer services, these figures are 56.9 and 43.1 percent, respectively. This indicates that where changes took place they did so principally in such a manner as to extend the urban field of large centers (that is, deconcentration) rather than to promote differential growth in truly peripheral areas (decentralization). The distance effect thus appears to be especially important in the location of high-order service employment.

Third, medium- and smaller-sized urban areas within the urban shadow of a major center had considerable difficulty in developing high-order service activities. Beyond the urban shadow, however, the ability of these smaller- and medium-sized centers to successfully generate a certain level of high-order service activity increased.

Finally, the two rural region types accounted for only 25.6 percent of total employment increases and only 12.2 percent of producer-service employment increases. Further, 56 percent of all employment increases in the two rural regions, and 64.5 percent of producer-service employment increases were registered in the central rural regions. Once again the notion of the extension of the urban field of major metropolitan centers is reinforced.

On balance, during the period in question, the space-economy of the Canadian urban hierarchy may be characterized as one of relative stability, a stability that is the result of two opposing forces. On the one hand, the growth of service activities tended to favor the absolute but not relative concentration of employment in the largest urban centers. In spite of negative relative shifts, the continued dominance of the large centers is unquestionable. On the other hand, there has been a significant shift in goods production employment away from the largest centers; these shifts took the form of both decentralization and decongestion.

The Spatial Concentration of Producer Services: Underlying Factors

What are the principal factors underlying the empirically observed concentration of producer services within the urban hierarchy? Three general elements may be identified.[5] First, there should be a pool of appropriately skilled human resources. There is general agreement in the literature that human resources represents the major factor underlying the location of producer services; the latter are generally much more labor-intensive than manufacturing. Since labor is a factor of production with limited mobility, especially in the current era of two-breadwinner households, the job must often come to the person. On the one hand, many producer services require a labor force with high qualifications, as manifest in a professional university education.

---

[5] See Coffey and Polèse (1986, 1987a, 1987b) for a more detailed treatment of this question.

Significant concentrations of highly educated people are generally found in metropolitan areas. Not only is this where a large proportion of them have been educated, but they are also attracted by high-quality cultural and public services and by the large labor market. In this context, it is important to note that the gap in the level of educational attainment between the residents of metropolitan and nonmetropolitan areas increased in Canada over the period 1971-81 (Coffey, Fullum, and Polèse, 1989). On the other hand, increasing externalization within high-order producer services also requires a pool of labor with lower qualifications. Such personnel are also available in metropolitan areas.

Second, opportunities for backward linkages should exist. Like manufacturing, the production of intermediate-demand services requires a particular mix of inputs. The spatial proximity between producer services and the sources or creators of knowledge, information, and technical ability is crucial. A given producer-service establishment must, therefore, have linkages to specialized consultants, complementary producer services, research institutions, universities, government organizations, hardware producers and so forth. In general, such facilities are available in greater scope and quantity in large urban areas.

Finally, there should be opportunities for forward linkages. Here the market for producer services is the issue. Approximately one-half of the output of the producer-service sector is typically purchased by other service establishments. A wide range of empirical evidence has shown that the latter tend to be concentrated in metropolitan areas. Further, in those cases in which producer services are purchased by the manufacturing sector, it is generally not by the production units themselves but, rather, by head offices or regional headquarters (Marshall, 1982, 1985). As corporate control and its associated spatial division of administrative functions tend to be highly concentrated in a small number of large metropolitan areas (Noyelle and Stanback, 1984; Daniels, 1985), it follows that the demand for producer services will be similarly concentrated. Thus, the spatial pattern of corporate headquarters imposes a marked centralizing influence upon the location of producer services (Wheeler, 1988). Also, the linkages between producer-service establishments and head offices are becoming even stronger and more self-reinforcing than in the past. As firms increase their product range and their use of technology, so their need for specialized producer services increases.

Where both forward and backward linkages are concerned, the concentration of producer services in a small number of large cities enables the transaction costs associated with the production and delivery of such services to be minimized. In particular, it is the cost of maintaining face-to-face contact between the producers, on the one hand, and their inputs and markets, on the other hand, that is potentially the most expensive element of intermediate-demand service production; this expense can be significantly reduced by spatial agglomeration. Evidence indicates that, unless the information transmitted is relatively standardized, new telecommunications technologies cannot be successfully substituted for face-to-face contact (Törnqvist, 1970; Pred, 1975; Gottmann, 1977). The conventionally held view that telecommunication technology will supplant face-to-face contact and thus produce a decentralization of producer services may be overly optimistic. On the contrary, it is possible that evolving telecommunications technologies will have the effect of increasing the concentration of these activities.

In sum, in large cities these forces of agglomeration tend to produce what may be termed a complex of corporate activities, which is the spatial clustering and mutual symbiosis of (1) the head or divisional offices of primary, secondary, and tertiary sector firms; (2) high-order financial

establishments; and (3) the producer-service firms that provide inputs to the first two types, as well as to each other. This complex of corporate activities is analogous to the concept of an industrial complex, in terms of its tightly woven network of input-output linkages.

Implications for Nonmetropolitan Economic Growth

In the last section, the high degree of spatial concentration of producer-service activities in Canada was noted, and a number of factors underlying this concentration were identified. It must be emphasized that Canada is not unique in this respect. Similar locational patterns have been observed in Britain (Marshall, 1988), France (Philippe and Monnoyer, 1985), the United States (Beyers, 1989; Noyelle and Stanback, 1984), and across a range of European countries (Daniels, 1985; Illeris, 1989). It thus appears that many producer-service activities are not locationally flexible, preferring, indeed requiring, large metropolitan areas. What, then, are the implications of the metropolitan concentration of producer services for nonmetropolitan economic growth?

First, this section specifically examines the question of telecommunications technology and the conventional wisdom that it can change these observed locational patterns. It then adopts a policy perspective considering, first, some issues related to the impact of the spatial concentration of producer services upon manufacturing in nonmetropolitan areas and, second, the types of measures that can be taken to stimulate the growth of producer services in nonmetropolitan areas.

The Impact of Telecommunications Technology

There are two major schools of thought concerning the effects of advances in telecommunications technology upon the location of high order office functions, including producer services. The first reflects what might be termed the conventional wisdom (for example, Webber, 1973; Downs, 1985; Kellerman, 1984; Kutay, 1986). According to this line of thought new information and communications technology will permit the decentralization of office-based activities by making it possible to transact business without face-to-face contact. These technological changes will, it is argued, reduce the effects of distance and thus eliminate the differences between home and office, between city and country, and between center and periphery.

The second school of thought is diametrically opposed to the first. On the one hand, it is argued, sensitive negotiations cannot be successfully concluded without face-to-face contact. On the other hand, it is argued, even more fundamentally, that new information and communications technologies free office functions from the necessity of locating in proximity to the operations that they direct. This contributes to the growing centralization of office-based activities in a small number of metropolitan areas (subject, of course, to the separation of front and back offices at the intrametropolitan scale), while at the same time permitting the decentralization of goods producing activities into areas characterized by lower factor costs. The greater the extent of the geographic decentralization of production activities, it is argued, the greater the need for the centralization of key control activities.

While there is a paucity of empirical research on the spatial impacts of the evolution of telecommunications technology, that which does exist, on balance, lends strong support to the latter viewpoint. Hepworth (1986) demonstrates that firms in Canada are using

telecommunications technology to maintain and to increase the level of spatial centralization in their organizational structures. Howells (1988), Daniels and Thrift (1986), Goddard and Gillespie (1986), Goddard et al. (1985), Moss (1987), and the Netherlands Economic Institute (1986) similarly show that, across a range of countries, advanced information and telecommunications technology has facilitated the greater centralization, diversification and internationalization of producer services. Further, much of the empirical work cited above (for example, Beyers, 1989; Coffey and McRae, 1989; Noyelle and Stanback, 1984) provides indirect evidence to support this view. While not focusing explicitly on the impacts of technology, this research indicates that, during the recent period marked by significant evolution in telecommunications technology, very little decentralization has occurred. Rather, the centralization trends that have been observed in a broad set of countries have developed in parallel with, and very possibly as a direct result of, advances in telecommunications technology.

The principal factor underlying this failure of producer services and other high-order office functions to behave in the manner suggested by conventional wisdom relates to the pattern of technological diffusion. There is generally a time lag in the adoption of telecommunications technologies, with the process of diffusion following the urban hierarchy. Thus, firms in metropolitan areas are able to enjoy an initial advantage in acquiring new technologies and, due to the availability of skilled human resources, are generally better able to benefit from the options presented by the latter (Lesser and Hall, 1987; Goddard et al., 1985). The flexibility of modern technology can compensate the generally smaller firms in peripheral regions by allowing them to obtain economies of scope to replace the disadvantages of small scale, but small firms in the more highly industrialized regions also obtain this advantage. In the final analysis, the difficulty facing nonmetropolitan regions in benefiting from telecommunications advances once again reflects the traditional problems of the nonmetropolitan areas. Their less diversified economic base, smaller local markets, and limited labor skills all impede their rate of adoption of new technologies. Thus, the very cities that have customarily been the centers for face-to-face communication appear to be the ones that will benefit most from the spread of advanced telecommunication technologies (Moss, 1987).

The evolution of telecommunications technology appears to be a two-edged sword. In theory, it can free various types of economic activities from the locational constraints that have ruled them in the past, as well as permit firms in peripheral regions to manage multisite organizations without establishing any part of their operations in a metropolitan area. On the other hand, advances in telecommunications technology enable head offices and producer-service firms in large urban centers to centralize their high-level management, scientific, and technical functions. The problem of regional disparities in the age of new telecommunications technologies is very likely to intensify (Lesser, 1987; Marshall, 1988).

Manufacturing and Producer Services in Nonmetropolitan Areas

Neither an analysis of spatial patterns in Canada, nor an exploration of the question from a more conceptual perspective indicates that there is much cause for optimism concerning the capacity for producer-service growth to have an impact upon the level of economic development of nonmetropolitan regions. Although there are specific exceptions, and although there are relative trends towards decentralization observable, producer services generally continue to be highly concentrated in major urban centers. This is the underlying reality that public policy must confront. It may therefore be useful to identify some of the basic issues that this reality raises in

the specific context of nonmetropolitan manufacturing, as well as to explore some of the essential elements that a service-oriented economic development strategy might include.

A first issue concerns the ability of rural manufacturing to function in an efficient and competitive manner while being spatially separated from a range of necessary producer-service activities, generally concentrated in metropolitan areas. In spite of a certain level of optimism concerning the ability of telecommunications technologies to negate the effects of physical separation, the fact remains that the principal characteristic of the production of a producer service (the process of "servuction," in the terminology of francophone Europe) is a high level of interaction between the producer and the consumer. It is doubtful whether this process can effectively bypass the exigencies of face-to-face contact. Although it is possible for representatives of metropolitan producer-service establishments to make visits to nonmetropolitan production facilities, this strategy will likely add substantially to operating costs, in the long run.

A second issue concerns a possible response of nonmetropolitan production units to the problem of the reduced physical access to producer services. Is rural manufacturing able to effectively compensate for this difficulty by developing its own internalized producer-service functions? The internalization strategy is certainly a possibility, although the recent literature on flexible production, vertical disintegration and external economies suggests that, in many cases, such a response would probably not be economically efficient, thus further reducing competitiveness (Coffey and Bailly, 1991).

A third issue concerns ownership and organizational structure. To the extent that the nonmetropolitan production units of multiregional or multinational firms channel their purchases of producer services through a headquarters located in a metropolitan area, the demand for producer services in such nonmetropolitan regions will be severely constrained, particularly if the region is essentially a branch plant economy. In the extreme case, a branch plant of an externally controlled multinational or multiregional firm may have no producer-service linkages with the local economy. It is therefore locally controlled or managed firms that furnish most of the demand for locally produced business services (Marshall, 1982). Where the level of local control over a regional economy is low, it follows that the potential for the development of local producer services will be modest. The acquisition of locally owned manufacturing or resource firms by external interests can thus have a debilitating effect upon the demand for local producer services. After indigenous companies are acquired, certain of their key producer-service inputs are usually transferred to the new headquarters where, as noted above, they are purchased from firms in the vicinity of the head office (Leigh and North, 1978).

A final point concerns the complementarity between goods production and producer services. The close interdependence between physical production and high-order services is now widely recognized; the latter may correctly be regarded as an integral element of any modern production process. It therefore follows that an economic development policy aimed either at productive activities (that is, primary and secondary activities) or at producer services, in isolation, will be destined to a suboptimal degree of effectiveness. Development policy in both sectors will need to be integrated.

Stated in slightly different terms, economic development policy must concern itself with both supply-side and demand-side aspects of producer services in lagging regions. Supply side incentives will only be effective if there is a demand for the service that is produced; in most

instances, this will involve local demand, since producer service firms in peripheral regions cannot be realistically expected to export a large proportion of their output in the short term. Thus, an important constraint upon the development of producer services in such areas is the poor performance of indigenous nonservice industries and the internalization of demand within large firms. This problem will not be easily resolved by a supply-side policy; a more proactive approach is necessary on the demand side.

From a policy perspective, what can be done to promote the mutual reinforcement of manufacturing and producer service activities in nonmetropolitan areas? Tangibly, a supply-side approach needs to include such measures as human resource policies designed to create a pool of skilled labor in a given region and, at a different scale of organization, incentives aimed at the creation of producer-service firms themselves. In theory, a substantial supply of skilled labor will assist a region in attracting or in generating high-order producer service (and other knowledge-intensive) firms. In addition to training and education initiatives, human resource policies may also include measures designed to improve the social-cultural-political environment of a given area, thus making it more attractive to the highly skilled labor force. Similarly, the presence of a range of producer-service firms may enable a region to attract or to create complementary (that is, nonservice) forms of economic activity.

The demand-side approach consists of generating sufficient demand to stimulate the initial creation and subsequent growth of high-order service firms. The growth of engineering services in Quebec is a particularly good example of this strategy (see below). Another element involves regional import substitution in producer services--the encouragement of externally owned firms operating in a region to increase their purchase of locally produced services. In this manner one can attempt to avoid the classic branch plant economy syndrome, in which multinational or multiregional firms operating in a region have virtually no backward linkages with the local economy. Similarly, a development strategy focusing on the creation of local business might require that the latter make significant use of local services.

Either a supply-side or a demand-side approach, in isolation, is a fragile one. If policy intervention is to be attempted, both avenues need to be pursued simultaneously. It is, for example, well and good to pursue human resource policies, but if parallel efforts are not made to stimulate the demand for this resource, the result will likely be the outmigration of the newly created skills.

In my view, the possibilities for the development of services in nonmetropolitan regions appear to be limited to the following:

(1) producer services that respond to the demands of local economic activities (for example, local manufacturing or primary sector firms);
(2) producer services that respond to local public sector demand;
(3) certain standardized and routinized back office service functions (for example, data processing or mail order activities); and
(4) tradeable specialized services derived from long-term local expertise in the primary or manufacturing sectors.

In the case of options one and two, services are fulfilling a principally residentiary function. They may, however, assist the economic growth of the local economy to the extent that they create jobs

and that they may be substituted for service imports from the exterior. Option three may be important in the provision of employment opportunities in a local area, but is unlikely to stimulate economic growth. Further, the available evidence suggests that these types of activities tend to deconcentrate on an intrametropolitan scale rather than to decentralize on an interregional scale. Option four represents the principal possibility for export development. The current expertise and predominant position of Quebec-based engineering consulting firms is a useful concrete example of this phenomenon and, as such, warrants a brief summary.

In the 1960's and 1970's, partially in order to resolve and/or to avoid union problems, Hydro-Quebec, a provincial crown corporation, began to use the services of independent firms to provide the engineering and management for their vast hydroelectric projects. This contracting-out strategy is clearly one of the major factors, along with an enhanced educational system that was able to assure a supply of highly skilled human resources, in the success story of the Quebec engineering consulting sector. Due to this decision, local firms, at first in cooperation with external partners such as the American giant Bechtel, were able to simultaneously establish a viable level of activity, to develop a base of expertise, and to acquire foreign technology. Over time, this combination has propelled several Quebec firms, which now work without foreign assistance (for example, Lavalin, SNC), to the status of major actors in the global context. The evolution of the Quebec engineering sector may be contrasted with that of Ontario, whose crown corporation, Ontario Hydro, chose to maintain a large internal engineering department (Verreault and Polèse, 1988).

Finally, the need for locationally specific policies must be stressed. The research on the Canadian space-economy suggests that small- and medium-sized cities (in the 25,000-100,000 population range) that are not in the zone of influence of a large metropolitan center have some potential for the development of producer-service activities to serve local demand. Centers within the shadows of major urban areas, and places below this size threshold do not appear to have such potential. Thus, if a regional policy based upon high order service activities is to be attempted, it needs to be tailored according to the characteristics of individual areas; a blanket approach will likely prove to be highly counterproductive.

Conclusion

The evidence that has been presented here suggests that the conventional wisdom concerning the capability of footloose producer-service activities to enhance the economic development prospects of nonmetropolitan regions is unjustifiably optimistic. The potential for high-order producer services to locate outside of major metropolitan centers is highly limited. The main locational shifts of producer services that most developed economies are witnessing are occurring primarily at the intrametropolitan level. In terms of specific policy interventions to stimulate producer-service activities in lesser developed regions, considerable caution must be exercised. It is not at all clear that such interventions will have a high probability of success; even more than in the case of manufacturing, the forces of spatial concentration acting upon these activities are very strong.

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Trade Policy, Corporate Strategy and Future Industrial Restructuring: The Impacts of Globalization on Rural Manufacturing

Amy K. Glasmeier, Jeffry Thompson, and Amy Kays[1]

Introduction

The global geography of production is the result of the evolving international political economy in which special interest groups, nation states, and global geopolitical mandates seek economic advantage through the formulation of trade policy. It is our contention that one must understand how the actions of the State influence the structure of global competition. Therefore, it is only through recognizing how State actions and trade policy have been used to structure the context for global competition, that we can speculate on how future changes will influence the strategic behavior of global players and project the implications for global geography.

As illustrated by the global textile and apparel industries, crises in developed countries' industries due to the emergence of low-cost competitors precipitated the development of increasingly complex bilateral and, ultimately, multilateral policies to regulate the flow of goods among countries. Attempts to insulate developed countries' industries from foreign competition through the use of negotiated restraints manifested in the development of a global regime of managed trade which permeates the experiences of many industries.

In this paper we recount the experience of the global textile and apparel industry as it has evolved under this system of managed trade. We begin by examining the literature on the role of the State in the evolving fields of international political economy and new international trade economics. This literature provides a basis for understanding how international trade policies, in conjunction with state-led development strategies, have influenced the evolving global geography of production.

Through an examination of the global apparel and textile industries we describe how one possible option of global trade--the formation of trading blocs--is affecting the U.S. apparel and textile industries. We conclude with comments concerning the impact on rural communities.

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The U.S. Textile Industry In a World of Global Competition[2]

The U.S. textile and apparel industry's contemporary competitive standing is the outcome of independent firm actions that have taken place within an artificial market context created by trade policy. Both tariff and non-tariff barriers have allowed industry the flexibility to follow suboptimal strategic trajectories not driven by market solutions. Moreover, while governmental actions to regulate trade have allegedly been initiated on behalf of domestic industry, they are often actually formulated to address conflicting national objectives. Because of such countervailing goals, largely reactive State strategies have generally failed to stem the tide of imports to U.S. markets. How U.S. apparel and textile firms have broadly responded to increased import penetration of their domestic markets over the post-war period has set the stage for much of the current move to create a new trade regime. On the other hand, the longevity of protectionism--in its imperfect form--has mutated the current industry structure so that it is now unable to repel the continuing onslaught of global competition.

While U.S. firm responses to foreign competition have varied widely, the broad theme underscoring most actions is cost competition. The most vivid illustration of this orientation is the fact that over the last three decades both industries have relocated production facilities to low wage areas to reduce overall production costs. Over the decades of the 1960's through the 1980's, the industry shifted capacity to low-wage States in the South (and to a lesser extent the West), generally avoiding the need to more radically restructure along the lines taken by European and Japanese firms.

Low Costs Dominate Corporate Actions: Defensive Segmentation is the Resulting Corporate Strategy

Examination of other actions taken to restructure clearly reinforces the perspective that price continues to be the dominant principle guiding U.S. firm strategy. For example, faced with excess capacity and rising capital costs, the textile industry significantly consolidated throughout the 1970's and 1980's. However, it was the perceived need to improve efficiency, primarily by reducing labor requirements, that drove new capital requirements (Toyne et al., 1984). Indeed, while capital outlays were made to modernize production capital in the 1970's, a large fraction of new investment was geared toward bringing production facilities into compliance with mandated federal guidelines governing pollution abatement and health and safety standards. Subsequent capital expenditures have been directed by labor savings objectives--not product development or process innovation.

Other significant shifts to restructure U.S. textile operations echo this prime directive of competition on the basis of price. The dramatic shift in market reorientation that occurred in the 1980's is one example. In 1980, textile production was almost exclusively dedicated to the production of apparel fabrics. Yet, within 10 years, textile producers had altered production to 40 percent apparel and 60 percent household furnishings and industrial textiles--market areas previously untouched by foreign competition (Wino, 1992). However, in these new segments

[2] The majority of information obtained in this section was derived from interviews with corporate and industry trade representatives. No individual firm is cited due to a request for confidentiality.

standardization and large volume have come to dominate technology and production processes, and little sophisticated rethinking of markets has been undertaken.

Household furnishings and industrial textiles comprise numerous submarkets. Hence it would appear that increasing levels of specialization would eliminate scale economies and produce market opportunities throughout the textile complex. But because of the relatively high capital requirements associated with establishing production of new textile products, and the preexisting oligopolistic structure of the U.S. industry, newly established market segments have been divvied up among the principal players and ruthlessly defended by predatory pricing and elimination of market contesters via acquisition.[3] With control of production, the textile oligopolists turned their attention to maintaining domination by regulation of demand via marketing (for example, establishing brand loyalty) and by technological superiority. Although product segments in household furnishings and industrial textiles may be relatively narrow, the textile oligopolists have attempted to cement their hegemonic positions by exploiting scale economies wherever possible. Research and development and investment in technology have followed suit, creating huge capital commitments that, theoretically, further ensconce the major players' positions.

While forging their market positions in household furnishings and industrial textiles via massive capital investment, the textile and apparel industry has continued to wage rearguard action in apparel textiles by applying constant pressure on the U.S. Government to maintain its protectionist stance. But the failure of the Multi-Fiber Arrangement (MFA) to halt the penetration of imported textiles and apparel to the United States has other serious implications for U.S. textile producers, regardless of their product orientation. Diffusion of apparel and textile manufacturing across the globe has created production systems that are far more responsive than those of elephantine U.S. corporate structures. This responsiveness is also the genesis of a new technological discontinuity because it constitutes the driving impetus for the creation and adoption of new flexible manufacturing technologies. As production technology has historically diffused throughout the world relatively easily and quickly, this pattern will probably be repeated. Saddled with massive overhead, it is questionable how well positioned the oligopolists might be if and when the next wave of foreign competition occurs.

Abandoned Markets Taken up By New Competitors

There has been additional fallout from the major textile manufacturers' shift of product segments. As U.S. firms have abandoned fabric markets, demand for imports of apparel textiles has been fueled. In some textile product segments such as silk, woolens, printed fabrics and certain manmade fiber products, the United States maintains virtually no capacity. Because U.S. garment makers must often import cloth and pay associated tariff penalties, they simply cannot be price competitive. Domestic firms that continue to produce apparel textiles, along with their apparel producer counterparts, are increasingly contested by foreign competitors. Nevertheless, they have maintained some ability to compete by retreating to standardized, lower-value product segments within semi-protected domestic markets.

Defense of the domestic U.S. market has also been bought at the cost of wage stagnation throughout the 1980's. This is symptomatic of the well-documented "bidding down" of U.S.

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[3] In 1986 Burlington acquired Fieldcrest, giving it control of 60 percent of the U.S. market for bedsheets.

manufacturing wages in the 1980's. Falling real income has in turn put continuing pressure on the price of consumer goods in the United States--the world's largest apparel market--and exacerbated the stratification of domestic consumer demand.[4] Evidence of the ongoing bifurcation of income levels is seen in the proliferation of discount retailing juxtaposed against the rapid rise of high-end, high-fashion, specialty retailing. Ironically, both have fueled offshore investment and sourcing of apparel goods. Discount retailers concentrate on volume sales and wield their enormous purchasing authority to wring out excess costs. Such deep price discounting has forced merchants to seek low-cost alternatives to domestically produced goods. In contrast, the high-fashion end in apparel generally requires higher skill levels. This is an ongoing problem in the apparel industry because as workers gain experience and skill they tend to move into better paying jobs.[5]

The Rise of the Apparel Organizers

Perhaps more than any other development, the rise of apparel production organizers has forged the U.S. shift to global sourcing and impacted U.S. production of apparel and textiles. In the late 1970's and early 1980's, recognizing unfulfilled demand created by changing demographic trends, new apparel suppliers sought to infuse their products with contemporary design elements that appealed to large consumer segments. Simultaneously, the declining capabilities and flexibility of U.S. apparel and textile manufacturers caused them to turn to overseas contractors at this critical juncture.

Today, apparel production organizers sell branded products that are manufactured literally all over the globe. They have created synergistic economies of scope by integrating design conception, manufacturing organization, and product distribution under one umbrella organization. Sophisticated mastery of this total packaging capability allows the production organizers to fragment production and optimally source garments without regard to geographic proximity.

While sourcing decisions should logically be based on the wage or skill base differentials of various labor pools around the world, U.S. trade policy, entrenched industry interests, and U.S. foreign policy initiatives have collided to skew the geographic distribution of apparel and textile production. Perhaps best illustrating this collision of interests are the 807 and Caribbean Basin Initiative (CBI) initiatives through which the U.S. Government sought to use trade policy to accomplish multiple economic and political objectives.

The Power of Trade Policy: 807, CBI, and the North American Free Trade Agreement--Trade Policy and Security Policy Converge

By the early 1980's it was clear that the system of bilateral agreements (MFA) aimed at limiting import penetration from various developing nations was being circumvented by the rapid global

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[4] The United States accounts for 20 percent of the world's consumption of apparel (Haggard, 1990).

[5] While textiles and apparel are not alone in the wage compression syndrome, these two sectors represent the lower end of the pay scale in terms of manufacturing jobs. Therefore, when alternative employment is available, employee turnover increases.

diffusion of apparel and textile production (USITC, 1990). Amidst rising calls for protection by industry groups, the U.S. Government settled on trade policy vehicles (the 807 and CBI programs) to enhance U.S. firms' cost competitiveness by providing them with alternative low-wage production platforms in the Western Hemisphere.[6] An additional rationale for these programs was political. Job growth in these underdeveloped nations was expected to spur economic development and provide a bulwark against potentially destabilizing Nicaraguan or Cuban political unrest and relieve migration pressures on the U.S. border regions from Mexico.

807 and CBI: Trading Off Labor Intensive for High Value-Added Ends of the Industry

The 807 and CBI programs were sold to industry and labor as a means of retaining high value operations (thus high-wage jobs) in the United States. In reality, benefits flowed primarily to larger apparel firms that have established low-cost production facilities throughout the Caribbean and especially along the maquila corridor of northern Mexico. Hence the State and larger industrial players achieved their respective objectives and sacrificed the increasingly marginalized and uncompetitive smaller firms of the U.S. apparel and textile industry who did not have links to low-cost supply.

The latest round of policy initiatives undertaken by the United States in the North American Free Trade Agreement (NAFTA), follows the same pattern as that established under the 807 and CBI initiatives. The U.S. Government is marketing the formation of the North American trading bloc as a means of fostering domestic job expansion by enhancing the competitiveness of U.S. growth industries, while simultaneously bolstering economic development in Mexico and thereby stemming the tide of illegal immigration.

Within the U.S. textile and apparel industries, there is considerable dissension about the pros and cons of NAFTA. In large measure a firm's size and the market segment in which it competes

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[6] The first of these initiatives, the 807 program allows "articles assembled abroad in whole or in part with U.S.-fabricated components, the product of the U.S., which a) were exported in condition ready for assembly without further fabrication, b) have not lost their physical identity in such articles by change in form, shape or otherwise, and c) have not been advanced in value or improved in condition abroad except by being assembled and except by operations incidental to the assembly process such as cleaning, lubricating, and painting." Duty is assessed on the full value of the imported assembled garment, less the cost or value of U.S. components.

Various manifestations of 807 production exist around the world. But perhaps the most well known are the maquiladora operations in Mexico, which, in an attempt to foster development in Mexico, were set up along the U.S.-Mexico border to take advantage of dramatically lower wages with reasonable geographic proximity to U.S. markets. Maquiladora factories import components duty-free from the United States, assemble them, and export the finished goods back, paying duty only on the value that is added in Mexico. Companies taking advantage of 807 provisions along the U.S.-Mexico border developed slowly until the peso devaluation of 1982. Maquiladora operations now account for more than 1.5 million jobs with major sectoral presence in auto parts, electronics, and apparel assembly.

The CBI extended 807 and 807-like benefits to the Caribbean nations of Puerto Rico, Honduras, and Costa Rica. Important tax benefits are derived by firms in selected sectors such as pharmaceuticals, which, because of their presumed developmental potential, receive preferred tax status. These countries have grown into major players in segments of the apparel and textile industries. It has been both the more labor-intensive and capital-intensive ends of the apparel industry that have migrated to the CBI countries. Because of the level of infrastructure in these countries, not to mention the incentives offered by the different countries, American firms have placed significant capital investments in low-cost regions.

determine the competitive options afforded by the proposed trading agreement. While for most large firms a NAFTA simply affords new markets to exploit or makes nondomestic sourcing options more attractive, for smaller domestic firms the new trade regime may force decisions that require fundamental restructuring of operations or market orientation.

Regardless of whether NAFTA is adopted, large firms are sketching out strategies that continue both to seek high volume sales of standardized goods and to minimize costs. While some moves toward process automation are being pursued, utilizing low-cost foreign labor obviates the need to make large capital investments to purchase state-of-the-art equipment or to pursue technological breakthroughs (Bailey, 1991).

Internationalization Offers Larger Volume, Niche-Oriented Opportunities

Of perhaps equal or greater significance is that relocating domestic operations affords the opportunity to achieve new scale economies. While domestic apparel branch plants were formerly located primarily in rural communities and kept relatively small to discourage worker organization, production locations in developing countries are characterized by large scale, non-union operations (USITC, 1990). Indeed, the major U.S. apparel manufacturers who are currently establishing operations in Mexico are building plants 10 times the size of the average U.S. branch plant.[7]

In the past, smaller U.S. firms have been able to compete with large, low-cost domestic producers by carving out market niches based on quick turnaround and flexible operations that can accommodate small orders or inventory stock-outs. Moreover, while overseas suppliers--primarily Asians--could manufacture garments at substantially lower costs than the smaller U.S. firms, they could not match delivery dates. Now the proposed free-trade agreement presents new opportunities for foreign direct investment in a low-wage country accessible to U.S. markets by land transport. By reorganizing Mexico's existing industry or transplanting new operations to Mexican soil, foreign competitors could clearly overtake the remaining domestic advantage.

Time and distance have been important determinants of production location from not only the standpoint of shipping a finished garment to a customer, but also in terms of coordinating the production process itself. For many smaller and specialized firms, it is critical to be located in areas that are geographically proximate to vital inputs, value-added services, and contractors. Proximity enables these firms to turn orders around more quickly.

The significance of spatial proximity is also cited by smaller firms as key to being able to take on orders to boost volumes necessary to sustain operations. Because of the increasing emphasis on value to the consumer, the quality of subcontracted work must be assured. In the United States, this has historically been achieved by physical oversight.

Small Size Offers Little Security to Firms in a Global Industry

The bonds of spatial proximity are vulnerable to the lure of low-cost production locations and the strategy of large firms to position themselves geographically. For smaller firms, insufficient capital

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[7] This figure was openly discussed by one of the U.S. largest apparel firms. Personal interview.

may make such options moot. Conversely, large firms may make massive investments at foreign greenfield locations, vertically integrate, and eliminate reliance on ancillary services that had previously tied them to domestic locations. It is uncertain what role large firms play in creating sufficient demand for ancillary services critical to maintaining a vibrant industry, but contractual arrangements between larger and smaller firms often provide the critical operating cushion for the ongoing operations of many smaller firms, particularly in the textiles sector.

To prevent the dissolution of the U.S. apparel-textile complex and, in particular, to competitively entrench smaller firms, many industry specialists advocate replacing traditional hierarchical and adversarial sourcing with new streamlined, cooperative interfirm transactions. This notion of quick response theoretically reduces inventory requirements and eliminates stock-outs at the retail level, thus offsetting the higher cost of domestically produced apparel.

While some quick response demonstration-type projects have been undertaken, little headway has been achieved in adopting this interfirm sourcing network on a broader basis. Foreign manufacturing locations or subcontractors continue to hold the edge over U.S. apparel firms (evidenced by the ongoing trend to move production or sourcing). Moreover, even where small firms may be willing to and capable of entering into quick-response production, the ability and necessity continuously to restock is being circumvented by other changes in the fashion industry. Instead of the tradition of 2.5 or 3 fashion seasons, there are now six, so sophisticated marketing and a keen awareness of consumer preferences rival inventory control as the retailer's chief concern.[8] But perhaps more to the point, the advent of a North American trading bloc means that apparel producers can have the best of both worlds, which is to say that they could produce within a quick-response framework in a low-cost location.

Other key components to smaller firm strategy, in the face of low-cost competition, have been to provide value-added services or to move upscale in product design. Nevertheless, such moves are similarly fraught with contradiction and risk. For example, when attempting to add specific value-added services such as single-item packaging, the operations of smaller firms become finely tuned to a few key customers. This increases business risk, and during periods of industry-wide turmoil, momentary readjustments by major players can have devastating impacts on their contract suppliers. While there is evidence of industry cooperation in previous periods of readjustment, globalization has heightened competitive pressures throughout the distribution and production chain. Under such circumstances, firm behavior tends toward self-preservation, and relationships traditionally based on trust break down (Harrison, 1992; Glasmeier, 1992). Clearly, ongoing consolidation within the retail sector is a phenomenon that signals diminishing opportunities for smaller apparel producers. Under great pressure to improve margins to debt resulting from the leveraged buy-outs of the 1980's, major retailers are reducing the number of apparel suppliers to cut administrative costs (Weintraub, 1992).

For smaller textile manufacturers the increasing penetration of low-cost imported apparel fabrics has resulted in pressure to change market orientation. No longer can they compete solely on the basis of price: they have to differentiate themselves. The opening of U.S. markets to Mexican-produced textiles (whether from new foreign direct investment or upgrading of existing mills) reduces quick turnaround advantages. The other possible response involves going upscale.

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[8] Personal interview, major American apparel manufacturer, New York, July 1992.

Rather than continuing to produce standard greige (unfinished) goods, they must add design as a component of value-added. Yet design has historically fallen under the prerogative of the fabric convertor, who is also among the smaller mills' principal customers. The great risk therefore is that the mills must build a new customer base while simultaneously developing new expertise in product design. These producers work within very short time horizons. Thus, there is a very narrow window within which they can execute strategic reorientations while simultaneously maintaining production.

In sum, neither the textile nor the apparel industry has undergone the radical restructuring necessary to operate effectively in international markets. The state in other developed nations sets policies to guide the restructuring of their domestic industries. In the United States, buffeted by conflicting powers, the state implemented trade policies that propelled the enormous worldwide expansion of textile and apparel production. Simultaneously, the U.S. Government created a hothouse domestic environment that rewarded firms for electing to adopt strategies that have misdirected investment, squandered human potential, and, ultimately, ill-positioned both industries to compete in the global economy.

Implications for Rural America: The U.S. Textile and Apparel Industries in the United States

The textile and apparel industries are two of the largest manufacturing industries in the United States. In 1989, the textile mill sector employed 726,100 workers and the apparel industry employed 1,091,500 workers. The industries are important sources of employment for women, who compose 76 percent of the apparel work force and 46 percent of the textile workforce. Many minorities are also employed in textiles and apparel: blacks are 25 percent of the workforce in textiles and 15 percent in apparel; Hispanics are 4 percent in textiles and 21 percent in apparel (Herzenberg, 1992).

Overall, the two industries employ workers whose educational qualifications are below the averages of other sectors. Thirty-nine percent of textile and 44 percent of apparel workers have not completed a high school education. This compares with 21 percent for manufacturing as a whole and 16 percent for all sectors. According to USDA estimates, 48 percent of the Nation's textile employment is in nonmetropolitan counties. Eighty-three percent of this nonmetropolitan employment is concentrated in five States: Virginia, North Carolina, South Carolina, Georgia, and Alabama. These States account for 69 percent of the Nation's textile employment. (This level of geographic concentration is surpassed only by the auto industry concentration in the Midwest.) The apparel industry is slightly more urban than textiles. Approximately 36 percent of U.S. apparel employment is concentrated in rural areas. Like textiles, 48 percent of this rural employment is concentrated in these five southeastern States (Redman, 1993).

The implementation of NAFTA, as presently anticipated, will introduce a profound change in the fundamental structure of the apparel and textile complex. The only detailed Government-sponsored study of NAFTA impacts on the apparel industry is being produced by the Office of Technology Assessment (OTA) at the direction of the Congress. The study focuses on the competitive potential of the Mexican apparel and textile industries. The contracted author, Thomas Bailey of Columbia's Teaching College, concludes that there will be little competitive threat presented by Mexico's apparel or textile industries. According to Bailey, and others, both

Mexican industries are inefficient and small in scale. As presently configured, the OTA study is largely correct. But the analysis is misdirected, for it does not take into account the strategy of U.S. firms planning to take advantage of the significant wage-cost differences (currently about 10-to-1) between Mexico and the United States among garment and textile workers.

There are three principal means by which a NAFTA will influence domestic textile and apparel producers: (1) elimination of the requirements to cut and finish material in the United States; (2) creation of surplus capacity with the opening of new facilities to service the Mexican market; and (3) attraction of foreign producers to Canada and Mexico to gain access to the U.S. market.

Perhaps the biggest impact of a NAFTA will be the reduction in the glue binding the textile and apparel complex together in the United States. If firms are no longer restricted to assembly tasks in Mexico and are allowed to undertake all phases of apparel production and finishing operations in Mexico, such phases as cutting and finishing will follow apparel production southward (Freeman, 1992). Large textile producers already acknowledge, that with the passage of a NAFTA, they will move pre- and post-assembly operations to Mexico to be closer to their customers (Mandelbaum, 1992). Other firms indicate that NAFTA investment guarantees make attractive larger capital investments in the more sophisticated ends of the industry such as spinning and weaving.

A secondary impact of a NAFTA will arise as firms establish production operations in Mexico to serve the Mexican market. Given the substantial wage differences within the NAFTA region, U.S. firms will be forced to produce in Mexico in order to effectively compete for Mexican market share. As U.S. firms establish new capital-intensive facilities, cost pressure will be placed on existing domestic operations. According to corporate interviews, new facilities will be much larger than the traditional plants in the United States. At least one company official, in a large apparel firm, indicated that while in the past modernization was accomplished through growth, future planned investments in Mexico will generate surplus production capacity and lead to job loss in existing U.S. plants.[9]

Finally, the passage of a NAFTA will virtually force many Far East producers to establish operations within the region. Already the largest foreign investors in Caribbean Basin countries are Korean textile and apparel firms (Rudy, 1992). Foreign producers will be attracted to Mexico to gain access to the American and the Mexican market. Given the very low cost of Far Eastern textiles, firms are likely to set up assembly and finishing operations using cheap Mexican labor to assemble products manufactured with very-low-cost Asian textiles.[10] While foreign producers using cheap Asian textiles will still initially have to pay tariffs to import goods assembled of Asian fabric into the U.S., the cost differential between U.S. and Chinese or Indian textiles far exceeds the potential impact of tariffs.

Textile and garment industry representatives suggest that a NAFTA will lead to serious restructuring of their industries. Experts involved in the development of new technologies for both industries concede that a NAFTA could result in a loss of half the total employment in the

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[9] Interview with a major industry representative, 1992.

[10] Under NAFTA the benefits of 807a will be diminished as quotas are eliminated (Freeman, 1992).

apparel industry in the first 5 years after NAFTA (Off, 1992). U.S. textile industry representatives have also suggested that the Canadian apparel industry will be particularly hard hit, given wage rate differences between Mexico and Canada (Cogan, 1992). Textile company spokesmen suggest that the initial impact on textiles will be small, but over time there is likely to be a bandwagon effect as textile producers relocate in mass after apparel producers move to Mexico.[11] Some textile firms with heavy investments in the United States fear competitors with low overhead will take advantage of opportunities presented under NAFTA and grab market share from the more vertically integrated firms.

The Implications of Globalization for Rural America: Summary and Conclusions

Although the negotiating team for the United States in the NAFTA talks has included representatives of virtually every industry and some who were concerned with the environment were added late in the process, one can legitimately ask, who spoke for rural America in the negotiations? Rural America may carry the principal burden of adjustment under NAFTA. Yet there are neither safeguards nor adequate remedies in place to protect rural communities from a potentially devastating impact.

Free trade with Mexico and Canada will probably mean increased exports of agricultural commodities, especially basic grains. But agriculture today provides only a fraction, less than 10 percent, of all rural jobs. For decades, manufacturing firms have located new branch plants in places like rural Georgia and Texas. Plants producing textiles, auto parts, and consumer electronics were moved to rural areas to take advantage of lower wages, less unionization, friendlier tax-abating local governments, and other contributions to lower costs. For many rural towns, a single branch plant provides a majority of jobs. In such cases, plant closures will destroy the livelihood of entire rural communities.

The decade of the 1980's left rural communities weakened. The 1982 recession accelerated their loss of college-educated people. Net outmigration of college graduates averaged 2 percent per year between 1986 and 1989 (McGranahan and Ghelfi, 1991). U.S. Department of Agriculture data show that the skill levels of new rural manufacturing jobs declined by 50 percent in key areas such as data handling, verbal aptitude, and GED requirements (Teixiera and Swaim, 1991). In addition, studies have shown that, for rural areas, the historic link between education and employment and earnings growth has considerably eroded (McGranahan and Ghelfi, 1992).

According to the USDA, rural America now has about 50 percent of the Nation's low-skilled, low-wage manufacturing jobs. Only 59 percent of rural workers have finished high school, compared with 69 percent in urban areas. More worrisome, only 11.5 percent of today's rural workers in the United States have completed college, compared with 18 percent in urban areas (McGranahan and Ghelfi, 1992). And disparities in levels of educational attainment between urban and rural areas, once converging, now appear to be widening, according to some measures.

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[11] Interview with Jerry Cogan, President of Milliken Research Corporation, 1992.

Even the most efficient rural operations of multinational apparel producers, such as Levi-Strauss, acknowledge that there is very little competitive basis for a national or a rural apparel industry in the face of a NAFTA (Lucas, 1992). Such industry programs as "quick response," designed to shorten the time between sales, production, and stocking, were developed to counteract the cost advantages of Far Eastern production. By eliminating time in process and therefore decreasing losses associated with misspecified stocking levels, firms are expected to experience a 25-percent increase in sales. But these programs can just as easily be operated out of Mexico. As one multinational apparel firm executive noted, "our recent investments in our Mexican and Caribbean operations include the most advanced technologies available. We are incorporating modular construction with quick-response capabilities. There is simply no other way to compete."[12]

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The False Promise of Industrial Districts for Rural Economic Development

Susan Christopherson and Beth Redfield[1]

Introduction

In the new environment created by global financial and product markets, industrial districts have appeared as a form of production organization associated with industrial competitiveness and regional economic prosperity. To some analysts, they capture the quintessential characteristics of what has been called "the post-Fordist" era (Storper and Scott, 1986). The vertically disintegrated production organization characteristic of these districts is particularly suited to meet demand coming from uncertain and rapidly changing markets in an increasingly integrated world economy. The industrial districts, together, compose the new international production landscape, a mosaic of regions, linked to each other and to the international market.

The success of these industrial regions is frequently attributed to sophisticated local regulation which: (1) encourages interfirm cooperation in areas such as sharing market information; (2) provides access to capital; and (3) facilitates the provision of goods necessary to the production complex as a whole, such as skill acquisition. This local regulation is associated with public governance, especially forms of municipalism. In fact, a key tenet of the industrial district conception is that these regions are successful because of their localism. Some analysts would go so far as to say that it is this localism--in production organization and in social infrastructure--that distinguishes the industrial district and makes for its success. In this schema, national regulation is associated with a now-defunct regime of mass production and with outmoded governance structures. With a loss of national sovereignty in an internationalized economy, it is the local that is preeminent. Not surprisingly, the promise of industrial districts has become the premise of industrial and economic development programs in many U.S. regions.

In this paper, we will critically examine some of the premises underlying the promise, particularly the dependence of successful industrial districts on local regulatory institutions. We argue that the possibility of developing industrial districts in the United States is seriously hampered except in the unusual circumstances which exist in defense industry-based districts. This is not because of lack of imagination, entrepreneurial ability, or trust, but because local regulatory institutions are only a contributing factor to the conditions which foster successful industrial districts. Much more significant are national regulatory regimes, particularly those governing firm investment behavior. These regimes can create conditions in which interfirm cooperation is possible because of long-term expectations regarding return on investment and because firms are primarily concerned with their market position over an extended period of time. Longer time horizons contribute to inter-firm cooperation in a variety of areas, including labor relations. And, an environment that fosters domestic cooperation enables firms, individually and in sectoral networks, to position themselves

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more effectively in international markets. At the same time, national regulatory regimes (both public and private) require firms to participate in the development of public goods, such as skill acquisition through apprenticeship programs. These requirements eliminate the prisoners dilemma facing firms which provide public goods and, in addition, create an avenue of cooperative interaction among firms. And, while municipalism may enhance social welfare and regional prosperity, national-state provision of such necessary public goods as health insurance ensures that basic needs are fulfilled as well as economies of scale are captured. National social provision eliminates a possible area of differentiation among firms and arguably provides a national competitive advantage in some sectors.

In contrast with other industrialized countries, including those in which industrial districts (in one form or another) appear to have thrived, the national institutional environment governing the financial markets and firms in the United States works against many of the features which are associated with successful industrial districts. It is only when some of these features are suspended (as a consequence of state defense expenditures, for example) that industrial districts arise in the United States. Our central contention, then, is that the character of different types of industrial districts and their relative effectiveness as a form of production organization capable of responding effectively to uncertain international markets are as much a function of national regulatory regimes as of local regulation.

To make this argument, we first describe the national regulatory regime that governs firm investment behavior in the United States and examine its implications for those characteristics which are associated with the success of industrial districts. We then examine some salient structural features of an industry, advanced ceramics, that is being used as a basis to build an industrial district in New York State. We look particularly at firm behavior in a situation in which returns will be long term and occur after substantial investment in research and development. Finally, we examine the character of the local institutional environment within which the advanced ceramics industrial district is expected to grow. Our analysis suggests the limitations of local efforts in industrial development, particularly in the form of industrial districts, and points to the need to consider the role of national policy.

The U.S. Regulatory Regime

One of the difficulties in dealing with the U.S. regulatory regime is that the United States is so often depicted as a nonsystem in comparison with the organized capitalist economies of continental Europe. This is useful rhetorically--the United States can be used as a straw man or foil in critiques of neoliberalism but the argument is analytically counterproductive. It allows problematic aspects of the organized capitalist regimes to be swept under the rug, and obscures how institutional features of the U.S. economy function coherently to sustain the firm-led adjustment regime.

In the United States, system-steering coordinative mechanisms which unite firm interests and national interests, as in the economies of Germany or Sweden, are absent. Adjustment to changes in product, consumer, and financial markets is made by individual firms rather than within a broader institutional framework, which constrains the actions of individual firms while enabling groups of firms to be competitive in world markets. System-forming decisions are made under rules which, potentially, set investor interests against those of the economy as a whole. Together,

the rules structuring an open, competitive, financial market and those governing the role and rights of investors have encouraged short-term investments to ensure high short-term returns and the avoidance of the long-term investments. The rules governing financial markets in the United States have also encouraged a conception of investment as a way to realize profits from firm assets (particularly from assets which can be easily valued) rather than a way to increase the productive capacity of those assets.[2]

In more specific terms, rules governing external and internal investment determine patterns of ownership, investor expectations, and the availability, types, and uses of information on investment and firm performance. As was already suggested, these rules include public regulation, through such mechanisms as tax policy or laws restricting ownership (for example, interlocking directorates and bank ownership of industrial enterprises), but also include forms of governance in the private sector. Professional standards, formal or informal regulations formulated by employer associations, or the Chinese Walls constructed by securities firms to protect against the appearance of insider trading, all structure firm economic behavior and investment decisions.

The distinctiveness and consequences of U.S. rules can only be appreciated by comparison with other contemporary capitalist economies. In comparison with Germany and Japan, firm ownership in the United States is more fragmented and investment decisions are more likely to be made by institutional agents such as pension funds than by interested, long-term owners. A conception of the investment process as one dominated by large numbers of small investors combined with trust-breaking regulation in the 1930's to produce a financial market in which investment is driven by transactions. Investment decisions are made with no specific information about the firm, as in index funds, or on the basis of limited public information that is accessible to all investors. By contrast, in both Japan and Germany financial market rules enable more concentrated ownership. These corporate or institutional owners exert considerable influence over the management of the firm, using inside information not publicly available. Financial market governance is carried out by strong intrasectoral institutions and organizations, such as employers' associations and credentialing bodies, in cooperation with the Government. In these economies, the prerogatives of concentrated ownership and private sector governance occur in conjunction with broader fiduciary responsibilities and more exacting behavioral norms.

The organization of external capital investment systems extends into investment decisions within firms or internal investment. The explicitly codified objective of the vast majority of U.S. firms is to "maximize shareholder value, measured by current stock price" (Porter, 1992: 53). The strength of this rule is such that managers who favor (by internal investment) long-term shareholder value over short-term stock price risk lawsuits for fiduciary mismanagement (Porter, 1992). One manifestation of this priority is that U.S. nondefense research and development spending by private firms in the 1980's was ranked 20th out of 23 industrial countries (Thurow, 1992).

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[2] Part of the explanation for this orientation can be traced to the history of economic development in the United States and the role of finance capital in that development. The capital market structure that emerged at the end of the 19th century in the United States was organized around small, decentralized, financial institutions. One of the premises behind the regulatory rules that developed was that large numbers of individual investors would participate in a market composed of diverse, private, financial institutions. So institutions, such as deposit insurance, and rules governing the rights of shareholders would be developed to safeguard investors rather than a financial system as a whole.

The central orientation to high short-term returns for shareholders is reinforced by other aspects of the internal investment system and by what have become standard practices in making investment decisions. For example, managers are rewarded for performance with stock options, giving them further incentives to keep short-term returns at a high level. Also, managers are chosen for their financial acumen rather than their technical expertise in the industry. Again, short-term returns on investment do not dominate internal investment decisions in Japan and Germany to the extent that they do in the United States. Investment decisions are driven by the owners' goals which are oriented, more frequently, toward corporate position in the long term. These goals may be met in a variety of ways, including technical superiority and increasing market share, but require investment in interrelated assets, such as research and development, capital equipment, and job training. Some of these investments can be easily valued while others, such as job training, or positioning in an international market, cannot.

The orientation of U.S. firms to short-term returns also reflects another set of market rules, or contractual relations among the parties with an interest in the firm: investors, managers, and employees. Because there are few if any functional links between investors and managers, transfer of ownership becomes the primary way in which investors exercise control over management.[3] Other interests, particularly those of employees, are not legally specified. Control is vested in investors who exercise little influence over the management of firm assets while those who manage and produce those assets have no influence over their disposition. This method of corporate governance contrasts with other regulatory systems, particularly that of Germany, in which control is exercised by all stakeholders in the firm: investors, management, and labor.

The U.S. shareholder-oriented market system also affects relations between management and labor in more general ways. One important manifestation of these effects is in the labor market. In the 1970's and 1980's, U.S. employers tended to rely on the external labor market for skills rather than investing in firm-specific skills through inhouse training. This strategy allowed them the flexibility required for a short-term investment orientation but has also meant that skill acquisition and the connection between skill acquisition and job performance are the responsibility of individuals. And, individual workers, uncertain of any long-term commitment on the part of their employers, place a lower priority on gaining firm-specific skills. If they invest in skills at all, they invest in industry-specific skills which allow them mobility across firms (Christopherson and Noyelle, 1991). As the labor market example demonstrates, the institutional rules governing financial markets and internal investment reverberate throughout the economy.

The consequences of the way in which market rules operate in the United States are difficult to generalize about since one of the essential outcomes is fragmentation of firm strategies. To some extent, this inter- and intrasectoral fractionalization is only visible by comparison with the organization of markets operating under different rules. To the extent one can generalize about a process characterized by fragmentation, however, several tendencies are apparent in the industries in which employment grew in the 1980's, namely, distribution and consumer services. First, there is a tendency to target service market segments with specialized products which are less price sensitive. Heart bypass operation centers and specialized financial services are two examples.

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[3] All of this discussion assumes that investors are acting in response to real managerial failure. A case could also be made that investors' primary motivation is to increase their short-term profits. There is no institutional mechanism to inhibit them from doing so.

Second, there is an apparent move away from cross-subsidization of product and service provision, one in which less profitable or more labor-intensive activities are integral parts of packages of services or transactions. Acute care in hospitals or routine transactions in banks exemplify services which have historically been subsidized as aspects of more broadly defined services.[4] Third, firms discriminate more carefully among the clients or customers for a product or service, limiting distribution to those customers who provide the fewest potential risks and largest potential profits. Services, such as insurance, but also those in which credit is an intrinsic aspect of provision (such as cable television) have altered availability and prices to mirror perceived risk. These calculations are frequently based on the characteristics of classes of individuals or residential areas. Fourth, firms have simply withdrawn from less profitable or high risk markets. Withdrawal can be explicit--a decision not to serve a particular clientele or area or to provide a particular product--or implicit, raising the cost of product or service provision so high as to effectively withdraw from the market. All of these tendencies affect the location of employment and place-to-place availability of products and services and, therefore, can be related to the increasingly uneven pattern of investment, employment, and access to services that characterize the contemporary United States.

The rules governing financial markets and corporations have repercussions for the full range of decisions made by firms. They have special ramifications for the types of firm investment decisions and interactions which appear to characterize the classic industrial districts. With respect to supplier relationships, the U.S. regulatory regime favors contractually defined, arms-length transactions among firms over long-term, trust-based relationships. Short-term profit and performance requirements mitigate against the assumption of shared risk. Supplier decisions are more cost-conscious, again, because of a short-term profit orientation, than under regulatory regimes in which supplier relations are intended to provide long-range technical superiority and quality control. As will be shown in the case of Corning and the ceramics corridor project, the relationship between large firms and their suppliers is an uneasy one with contradictory motives. Specialized suppliers are frequently perceived as potential competitors for ideas and labor. The large firm must tread a fine line between controlling supplier output and minimizing assumption of responsibility for supplier firm costs, including training costs, and failures. The result is a highly contractualized buyer-supplier relationship, one not conducive to shared information or intrasectoral support for shared goods, such as skills.

In the U.S. regime, information-sharing is more likely to occur among individuals than through structural cooperative firm efforts. Networking is a phenomenon that responds to the highly uncertain nature of employment in industries organized around transaction-based projects, not to the need for ongoing relationships between buyer and supplier firms. The problem of protecting proprietary information in circumstances where firms are primarily concerned with the value of their assets, including innovative ideas, leads in some cases to the purposeful development of information barriers. Such is the case, for example, in the Research Triangle Industrial Park in

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[4] The move away from cross-subsidization has two additional effects. It changes the substantive content of the service and may reduce its overall value and effectiveness. The fragmentation of health care services for the elderly and the elimination of routine home care services results, potentially, in the lodging of more people in costly nursing homes. The application of profit standards to various functions in universities, such as interdisciplinary programs or language departments, changes the meaning of the university and undermines the potential educational and intellectual benefits that derive from economic interdependence.

North Carolina. On the other hand, an emphasis on public information for the use of investors limits the types of information necessary for educated investment.

In a firm-led adjustment regime, such as that in the United States, there is a narrower range of possible options for sheltering innovation and for turning innovations into marketable projects. Both short-term performance requirements and firm individuation limit access to long-term investment capital and the ability to maintain experienced workers beyond the innovation phase. This widely acknowledged problem means that research and particularly, development, are likely to remain within large firms who have some long term objectives. To the extent, however, that these large firms are publicly traded, they will tend, as has been the recent experience, to reduce research and development investments in favor of activities which produce assets that can be easily valued.

With these constraints in mind, we turn to a discussion of a specific attempt to build an industrial district around an industry with strong potential for long-term growth in manufacturing.

The Case of Advanced Ceramics

According to a 1988 study conducted by the U.S. Office of Technology Assessment (OTA) and an earlier study by SRI International, the advanced ceramics industry in the United States is the province of very large manufacturing firms (OTA, 1988; SRI, 1984). Establishments which are not directly sheltered by these firms often engineer quasi-sheltering relationships with universities or through a variety of risk sharing relationships with other firms (joint ventures, license agreements, or Federal subcontracts).

The primary reasons for this pattern of transactions are the limitations of market development, technical obstacles impeding effective competition with other advanced or conventional materials, the need for substantial research and development resources to overcome these obstacles, and the high costs of production processes designed to do so. With costs so high and capital relatively inaccessible to smaller firms, the emergence of a cadre of smaller independent firms offering skills and know-how has remained largely limited to technical service providers, many of whom use customers' facilities and equipment.

Data on this industry are scarce, as is suggested by the effort to gauge the size of the industry's market in the paragraphs which follow. The 1987 *Census of Manufacturers* began the process of creating a new Standard Industrial Classification code (Marske, 1987), and the results of data collection on consumption and shipments of ceramic raw materials and components are reported below. In the meantime, no employment or establishment size data is available for advanced ceramic activities. The analysis which follows is based on the two studies cited above, a review of numerous trade articles, and interviews with some ceramic firms in western New York State.

Advanced Ceramics: The Market

With few commercial successes so far, "advanced" ceramics are primarily identified as a branch of the material sciences. Ceramic materials have always been distinguished by their high degree of resistance to harsh environments and inability to bear loads. Recent technological breakthroughs have improved the load-bearing capacities of ceramics, opening up a variety of potential

applications. Current advanced applications range from the relatively low-tech to the high-tech, including ceramic scissors, glass saucepans, prosthetics, longer-lasting refractories, turbocharger rotors, high-strength automotive glass, multilayer integrated circuit packaging, ceramic armor for tanks, and nose cones for Patriot missiles. Engineered, technical, or structural ceramics must meet load-bearing requirements, while serving some traditional ceramic purpose, such as the high-temperature environment of a low-heat-rejection engine.

The intrinsic properties of ceramics and distinctions between ceramics and other materials are rooted in their atomic structure. Generally, due to the strong bonds holding atoms together and limiting electron motion, ceramic materials can withstand thermal and chemical attack, and conductivity is limited. Due to these same properties, ceramics do not bear loads well. Instead of deforming to relieve stresses, ceramics develop minute cracks which propagate throughout the component until a fracture threshold is reached. The component will exhibit no signs of impending failure, failing suddenly and catastrophically.

Ceramic materials are used in three forms: monolithic, composite, and as coatings. In conjunction with processing techniques, each represents a balance of the goals of maximizing high temperature and strength properties, broadening the range and complexity of shapes possible, and reducing costs. Monolithic ceramics, components made exclusively of ceramic materials, maximize thermal and chemical resistance qualities and deemphasize strength qualities. Composites incorporate whiskers, fibers, or particles woven throughout the structure of the material, bridging and preventing incipient cracks, thus strengthening the component. Composites, however, cannot operate in at high temperatures, and processing costs are very high. Ceramic coatings increase the thermal and corrosive immunity of metallic components and eliminate the need for the ceramic to bear loads. Coatings may be an interim technology, but the halting pace of monolithic and composite commercialization may prove coatings to be the lasting ceramic technology.

In terms of the first group of explanatory hypotheses identified by Holmes (1986), those relating to the market environment, the advanced ceramic industry reflects characteristics of market failure. This has led to the sheltering of advanced ceramics activities within larger organizations. This section will discuss two instrumental reasons for the market failure of advanced ceramics: small markets and large research and development expenditure requirements. However, not all advanced ceramic market segments are so sluggish. Ceramic coatings, in particular, offer opportunities for more rapid returns on investment.

The recent breakthroughs in ceramic technology have raised expectations that advanced ceramics will be able to substitute for scarcer and less efficient conventional materials. Such substitution would reduce demand for oil and other strategic materials and has prompted both public and private interest. The potential market for ceramic auto components would be sizable; the technology would reduce U.S. dependence on foreign oil and would radically change the appearance and maintenance requirements of the cars we drive. At the higher operating temperatures allowed by the incorporation of only a limited number of ceramic components, vehicle engines could increase thermal efficiency (energy in the fuel converted to useful work) to over 40 percent, compared with today's engines operating at approximately 25 percent efficiency (U.S. House of Representatives, 1990). In terms all can understand, a car with an all-ceramic engine would not have a radiator, never require an oil change, and require fewer trips to the gas station.

Substitution has prompted political interest since advances in ceramics technology promise a reduced dependence on relationships with hostile or unstable nations for the supply of oil and materials required for the fabrication of superalloys (over half of the world's production of chromium, cobalt, manganese, and platinum takes place in South Africa, the former Soviet Union, and Zaire).

However, commercial applications have been slow to materialize. As of 1989, the only ceramic material used in a typical U.S. car was glass, and ceramics are not mentioned among the most promising materials by industry analysts (Wrigley, 1989). Further, while there has been a substantial Federal commitment to the funding of Department of Energy ceramics research, the preferred policy is one of forcibly stabilizing the supply of foreign oil rather than reducing demand for foreign oil.

According to the OTA, the advanced ceramic industry is concentrated in a small number of large- and medium-sized firms for two reasons. "First, the small current markets for ceramics can support only a limited number of companies, and, given the technical and economic barriers that continue to plague structural ceramics, these markets are unlikely to expand rapidly in the next few years. Second, the complex technical requirements for successful participation in the industry necessitate a greater commitment of money, skilled personnel, and facilities than can be afforded by most firms"(OTA, 1988). While fragmented, available market data and anecdotal evidence confirm the small size of markets, the importance of research resources, and perhaps reinforce the importance of internal markets to the survival of the industry.

For the most part, sales are not meeting the expectations of the enthusiasts of just a few years ago. The advanced ceramic applications achieving market successes are mostly variations and improvements of conventional products (refractories and cookware) or applications which deemphasize load-bearing requirements (disposable cutting tool inserts, armor, integrated circuit packaging and substrates, and tougher glass products). The 1987 domestic market for advanced structural ceramics was estimated by one OTA contractor study at $171 million, including sales of wear parts, cutting tools, heat exchangers, engine components, bioceramics, and aerospace applications. However, estimates vary widely, depending on the products included. The earlier study by SRI International estimated the 1985 domestic market at $205 million, excluding the market for cutting and forming tools. SRI reported this market separately for two reasons: unlike other coating applications, the entire value of the tool is accounted for by the coating, and the machine tool manufacturers dominating this segment have few or no business or technical relationships with other ceramic activities. In contrast, according to *Ceramic Industry*'s 1989 survey of advanced ceramic manufacturers, engineered ceramics, which include a broader array of products, accounted for 19 percent of the 150 companies' total advanced ceramic sales, or roughly $850 million (Baxter, 1989).

Although estimates conflict, it is generally agreed that the coating market is the largest and fastest growing of the structural ceramic markets. The 1986 coating market was estimated at $1.1 billion, with cutting tools dominating this market. In turn, ceramic composites command the smallest market; the total 1988 market was estimated at $77.2 million, with $50.4 million sold to commercial markets and the remaining $26.8 million sold to defense-related markets.

As previously mentioned, the *1987 Census of Manufacturers* reports data for the consumption and value of advanced ceramic materials and components for the first time. No overall market volume

may be derived from these figures; their value lies in their use for comparative purposes. The generally higher volumes of consumption of ceramic raw materials suggests that these industries are fabricating and coating components inhouse. The low real volumes confirm that production is confined to precommercial activities. In addition, many of the industries identified by the Census as likely to consume ceramic components or raw materials did not report amounts significant enough for inclusion in the Census data.

In addition to relatively small markets, research resources are extremely important to the industry, explaining much of the dependence of advanced ceramic activities on large firms. According to a 1987 survey, the U.S. Advanced Ceramic Association estimated that private expenditures on advanced ceramic research were $153 million (OTA, 1988) or almost 90 percent of domestic advanced ceramic sales as estimated by the OTA. U.S. public expenditures are also high relative to the expenditures of other major international participants. Trade sources have estimated that the U.S. Government spends $100 to $125 million annually on advanced ceramic research and development (OTA, 1988). This is roughly equivalent to the amount spent by the Japanese Government and in excess of approximate 1985 expenditures by the Federal Republic of Germany at $75 million, France at $64 million, and the United Kingdom at $51 million (OTA, 1988). Private sector investment by the Japanese, in particular, is considerably more significant and responsible for their lead in the technical development of advanced ceramic products.

The dominant Federal provider of research financing to the advanced ceramics industry is the Department of Energy (DOE). Patterns of spending largely coincide with the pattern described previously for defense. According to the OTA study, DOE is notoriously poor at technology transfer, which may, in part, be due to the oligopolistic structure of the supplying industry. For the DOE program, the two prime contractors are Allison Gas Turbine Division, General Motors Corporation, and the Garrett Auxiliary Power Division of the Allied-Signal Aerospace Company. The subcontractors are The Carborundum Company, Norton/TRW Ceramics, GTE Laboratories, Manville Sales Corporation, Corning, Inc., Garrett Ceramic Components Division of Allied-Signal, and Ceramics Process Systems. Subcontractors do not compete to supply components. Rather, they fill the role of specialized subcontractors (U.S. House of Representatives, 1990).

Finally, the importance of sheltering by large firms is also suggested by the experiences of some small- and medium-sized ceramics firms. Ceradyne, started in 1967 by an Alfred University graduate, has actively sought acquisition by resource rich companies in an effort to remain at the cutting edge of ceramics technologies. In 1974, Ceradyne was bought by TRE Corporation, a construction supplies conglomerate, and was soon sold to Kyocera Corporation to raise cash. Kyocera was subsequently forced to sell, due to Ceradyne's defense-related work. After a period of independence, the Company sold an 11 percent interest to Ford, which agreed to contribute $5 million in assets and some 80 ceramics patents.

The high cost of inputs and production processes used to overcome technical limitations are responsible for the slow growth in demand for structural ceramics and the need for sheltering. In the United States, the only options for that sheltering function are in very large firms who themselves cannot bear the substantial long-term investment in research and development that will be required to translate innovations into product in this industry.

Despite these obstacles, the apparent potential of advanced ceramics for transforming the regional economy of Upstate New York from one of continuous decline to one approximating its heyday

as one of the foremost agro-industrial districts of the mid-19th century has led to both interest and public investment in what has become known as "the ceramics corridor." The developments in this region, however, again point to the ways in which localism fails as a development strategy. In the industrial district model the reputation of the region serves to channel investment into the dense network of firms. In the ceramics corridor, however, while some investment will indeed go into the region, it will primarily feed the large firm which shelters investment and production, Corning, Inc. Because of the absence of an integrated network of producers and suppliers and, importantly, the lack of infrastructural investment in the region, few multipliers will be generated and the resulting economic development can be expected to be quite narrow.

The Contradictions of Sheltering in the Large Firm

The inhibiting effects of large firm institutional involvement on the formation of an independent production network are suggested by a number of trends. Despite any efforts to increase the number of small ceramics firms in the area, the dominant player in the region is, and can be expected to remain, Corning, Inc. (the Company) based in Corning, New York.

Corning Glass Works was established in Brooklyn in 1851. In 1858, with railroad development in full swing, the Company was brought to Corning, New York, in Steuben County, by investors pledging $50,000. The founding family, the Houghtons, still controls 15 percent of the Company and have filled the chief executive's seat throughout the Company's history. The Company changed its name to Corning, Inc. in 1989. By 1989 the Company's net income had grown to $261 million and it employed 27,500 workers. The Company operates 29 plants in the United States, with 10 in Upstate New York, and 15 plants in Canada, Mexico, France, Germany, the United Kingdom, and Brazil. Its subsidiaries and associated companies extend their global network throughout Europe and the Asia-Pacific region. Given this multilocational structure, any stimuli to the Company's development engendered by corridor activities will be filtered through its global economic activities.

Originally, the Company produced tableware, decorative glass, railway signal lenses, lantern globes, thermometer tubes, and later, light bulbs and picture tubes. In the 1980's, the Company pursued an aggressive restructuring program, divesting from many of the slower growth markets and investing--through joint ventures and acquisitions--in fast growing markets such as fiber optics, laboratory services (clinical testing and pharmaceutical development), and automotive emission control substrates. While much of the growth has been engineered through acquisitions, internally generated growth is also important to the Company's strategy. Research and development expenditures of $124.5 million in 1990 were nearly double the U.S. industry average (according to the Company) and resulted in a new, tougher, optical fiber for local-loop installation, improved catalytic action in auto emission substrates, and a glass-ceramic memory disk.

Corning, Inc.'s strategy of growth through acquisition and dominant profile in the region suggests that a ceramics corridor will largely function in the shadow of the Company. Certainly, the real possibility of absorption for some firms and dependence of other firms on the Company for essential services and other forms of assistance describes an arrangement which exists at the convenience of Corning, Inc. Corning has demonstrated willingness to buy strategic access to markets and technologies, and will likely view competitors emerging from the ceramics corridor as

candidates for acquisition. For instance, the Company has bought closer access to the potential automotive market for advanced ceramics with its acquisition of the auto racetrack at Watkins Glen, in neighboring Schuyler County. While the track itself does not purchase advanced ceramic inputs, it is the heart of a small scale, and often informal, high performance automotive engine industry, an important test market for ceramic engine components. Regarding its relationship to the firms of the ceramics corridor, a Company representative said that it is not interested in using the incubators as generators of new activities for Corning but that it would consider buying those emergent competitors active in strategic technical areas. Corning's provision of producer services and other forms of assistance suggests that a ceramics corridor would be an extension of Corning, Inc.

In the United States, the external investments generated by the advanced ceramics industry are few and principally include demand for expert technical services (equipment design, materials characterization and processing, new product development) and coating services. As a high-technology business, the industry can be expected to generate external investments in marketing services to reach dispersed global markets, channels for information exchange, training, and quality-of-life enhancements important to attracting and retaining professionals. In these respects, the industry functions developing in the United States are those associated with services rather than manufacturing.

The ceramics corridor project may capture some of the external investment generated by the service-oriented aspects of the advanced ceramics industry, given the history of corporate cooperation with educational institutions in the regions. This pattern of development, however, is likely to contribute to a growing income disparity among population segments and exacerbate rather than ameliorate weaknesses in the local economy. It certainly will not produce the kind of municipalism characteristic of the successful industrial districts. Direct investments will generate jobs for highly skilled technical workers, while indirect investments will benefit extraterritorial providers of service and manufactured producer inputs and local providers of consumer and residential services.

Conclusion

The initial questions regarding the industrial district model emerged in conjunction with a broader debate regarding its origins and the variety of ways in which firms could go about responding flexibly to changes in the international economy. These critiques have led to a set of broader and deeper questions about whether there is a single model for economic change in the contemporary economy and, if not, what processes are stimulating various types of firm investments and locational outcomes.

Two prominent alternative explanations of locational processes have emerged. The first emphasizes economic integration and the role of transnational firms in locating economic activities. The second comes out of another conception of processes structuring the international economy and emerging out of an awareness of the role of market institutions. This paper has reflected the second of these alternative explanations and examined how the particular pressures exerted on firms, operating within U.S. financial market rules, tend to produce some types of outcomes, such as the concentration of activities in large firms, and inhibit others, such as the development of small firm networks as sheltering mechanisms.

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U.S. Banking Change and Local Economic Development

James W. Harrington, Jr.[1]

Introduction

The companies providing financial services to American households and businesses are consolidating at a rapid and increasing pace. This process and its speed are based on two of the most powerful institutional motives imaginable: (1) the private-sector desire for profit in an industry increasingly beset by high fixed costs, commodity-level products, and loss of markets to other financial industries; and (2) the governmental desire to maintain stability and confidence in parts of the industry that face insolvency and dissolution. Consolidation has brought and will continue to bring increased economic concentration to the U.S. banking industry, an industry that has maintained the largest number of financial institutions per capita of any industrialized nation. But what is concentration? In a multidimensional industry such as financial services, concentration is not a straightforward concept. Complicating the meaning of bank concentration are questions of geographic scale, product substitutability, and competitive threats. The *results* of concentration on local regions are varied: potentially increased efficiency, increased range of services, and interregional capital flow, along with increased market power and reduced employment.

This paper provides a brief overview of the economic and technological changes that motivate bank consolidation, the regulatory changes that allow and even encourage it, the results of substantial interstate differences in bank regulation, and a survey of the effects of failures and mergers on State and local economies. The focus will be on commercial banking, but must include the market-concentration and local economic effects of massive failures, mergers, and asset sales in the thrift subsector.

Economic Changes

Size Distribution

There are approximately 12,000 U.S. commercial banks (that is, depository institutions chartered as banks and regulated by State and/or Federal regulatory agencies), holding $3.5 trillion in financial assets. In 1989, the 44 commercial banks with assets above $10 billion (a mere three-tenths percent of the total number of bank companies) held 38 percent of total commercial bank assets. In 1991-92, a spate of mergers occurred among the largest U.S. bank companies, yielding this list of largest banks: Citicorp, with over $200 billion in assets; Bank of America and Security Pacific Bank with combined assets of just under $200 billion; Chemical Bank and Manufacturers Hanover Trust with combined assets of $130 billion; North Carolina National Bank and C&S-Sovran with combined assets of over $110 billion; and Chase Manhattan, with nearly $100 billion

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[1] The author is an associate professor of Public Policy and Geography at George Mason University, Fairfax, VA, and gratefully acknowledges the research assistance of J. Bradford Hunter. **Note:** The views expressed in this chapter are those of the author and do not necessarily represent the views of the U.S. Department of Agriculture.

in assets. Thus, the Nation's five largest banks hold between one-fifth and one-quarter of total commercial bank assets. The five largest banks in Canada and in France hold about 80 percent of the commercial bank assets in each of those countries, and in the United Kingdom, the proportion is 70 percent. So even with the megamergers, the U.S. banking industry is not very concentrated when compared to other countries. State regulation is a strong reason for that relative lack of concentration, at least when concentration is measured at the national scale. However, bank concentration is much stronger at the local level, as we shall see.

Scale Economies

Through the early 1980's, most studies of economies of scale in banking used data limited to banks with assets under $1 billion; these represent 97 percent of U.S. banks but only 30 percent of the industry assets. The studies found economies of scale in bank *establishments* (branches or unit banks) of up to $50 million in deposits. Even today, this is not an unreasonable minimum economic branch size.

More recently, Hunter and Timme (1988) modeled costs and outputs (measured as the total value of loans and nonbrokered deposits) for 219 of the largest U.S. banks (excluding unit banks and money-center banks), for each year from 1980 to 1986. There were five categories, covering assets sized from $0.75 billion to $25 billion. Hunter and Timme found evidence of scale economies for banks with assets between $0.75 billion and $5 billion, but no scale economies among banks larger than $5 billion. In addition, the degree of scale economies for the $0.75-$5 billion-sized classes increased over the period. The authors termed this change in scale economies "technological change;" it was measured as all change in costs that was not attributable to input prices or product mix, and would include improvements in information or systems technology, management techniques, regulatory change, or new products. Controlling for scale, technological change itself produced steadily greater cost reductions in successively larger-sized categories. The implication is that, during the first half of the 1980's, large banks were better able to reduce costs by availing themselves of regulatory changes, systems changes, and product changes than were mid-sized banks.

There are other sources of potential scale economies in large, multiple-branch banks: diversification of credit and liquidity risk, marketing and name-recognition, and raising of deposits and reserve funds.

Scope Economies

Multiproduct banking can be understood as economies of scale in the production or procurement of certain inputs that are shared across products. For banks, this includes client information, account-processing software, and investment in branch facilities. However, the econometric work of Hunter and Timme (1989) found little empirical evidence of economies of scope. Indeed, in banks with assets between $5 billion and $25 billion, they found that production of multiple products *increased* costs. The widespread presence of multiproduct banking suggests that other, less-easily measured savings or revenues are yielded, stemming from the benefit to corporate clients.

Technological Change

The increasing reliance on elaborate computer systems by banks has driven some of these increased scale and scope economies, and has created pressure on bank costs and profits as information acquisition, processing, and transmission take increasing proportions of income from interest spreads and fee-based services. The rate of increase is dramatic: the U.S. bank sector increased its information-systems expenditures by 20 percent a year in the 1980's (Roach, 1991). The spending is not gratuitous, as use of these information systems is necessary to maximize interest spreads on complex transactions and to provide fee-based services (Steiner and Teixeira, 1990). The expense of these systems is forcing some banks to abandon internal performance of some functions such as check clearing and check handling, credit-card billing, and specialized equipment leasing. This, in turn, is increasing the market niches available for specialist providers of these services and their back-office operations.

Employment Change

The new products of and increased demand for financial services have made the sector almost recession-proof (see table 1). Between 1974 and 1975, U.S. annual average nonfarm employment declined by 1.7 percent, to 76.9 million. Simultaneously, finance, insurance and real estate (FIRE) employment grew by 0.4 percent, to 4.2 million. In 1981-82, U.S. employment was down by 1.7 percent, to 89.6 million, while finance-sector employment grew by one percent, to 5.3 million. During the current recession, U.S. employment fell by 1.5 percent between June 1990 and June 1991, to 108.8 million. This time, however, employment in the financial sector declined by 0.7 percent, to 6.7 million. Of these 6.7 million jobs, 2.3 million are in depository institutions and 1.6 million are specifically in commercial banks.

Table 1--Employment change in U.S. financial institutions during national recessions

	1974-75	1981-82	1990-91
Nonfarm employment, end of period	76.9 million	89.6 million	108.8 million
Percent change over period	-1.7	-1.7	-1.5
FIRE employment, end of period	4.2 million	5.3 million	6.7 million
Percent change over period	+0.4	+1.0	-0.7
Employment in depository institutions	--	--	2.3 million
Employment in commercial banks	--	--	1.6 million
Employment in savings banks	--	--	0.4 million

Source: U.S. Department of Labor, *Employment and Earnings*, July, 1991.

However, employment growth in financial services has probably halted for a period longer than the present recession. The consulting firm of McKinsey & Co. have predicted the loss of 300,000 jobs in U.S. commercial banks (18-20 percent of the current workforce) over the 1990's. Jobs of all types will be lost, though clerical occupations (tellers, data entry, and paper handlers) face

greater proportional reductions. The reasons for employment decline include: mergers, followed by consolidation and elimination of branches and duplicative support services, reduced expenditures on information-handling systems and staffs, and increased contracting-out so that systems become more fully utilized. The mergers of very large banks announced during 1991 alone should cause the loss of nearly 30,000 jobs. In addition, bank companies such as Citicorp and First Chicago have attempted to placate shareholders concerned about massive loan losses by reducing costs through massive layoffs (Hirsch, 1991).

The United States will see the increase in labor productivity that has eluded its service sector since the 1970's, but the process will not be a comfortable one for employees, former employees, or potential employees. Companies have learned that increases in labor productivity do not result automatically and inevitably from investment in capital equipment (computer hardware and software, telecommunications capacity, automated teller machines). Organization and production techniques must be changed to substitute these investments for work-force increases (Roach, 1991). Otherwise, the elaborate expenditures merely complement or duplicate staff capabilities. Employment grows, but wages and salaries stagnate. In banking, the compound crises of loan competition from short-term commercial securities, deposit competition from money-market mutual funds, and new competition from interstate and international entrants have made increased labor productivity a more important goal. Even if the banking sector maintains its current share of the overall financial market after the current recession, which is doubtful, employment will likely decline.

Regulatory Change, Crisis, and Proposals

Deregulation

In response to the array of high-interest options available to small savers in the inflationary 1970's, Congress gradually deregulated the interest rates offered by thrifts and banks between 1980 and 1985. The Depository Institutions Deregulation and Monetary Control Act (DIDMCA) of 1980 allowed all depository institutions to make third-party payments from interest-bearing accounts (interest-bearing checking, which compete with negotiated orders of withdrawal (NOW) from savings accounts), and called for gradual lifting of interest-rate ceilings on savings in depository institutions by lifting of Regulation Q. The Garn-St. Germain Depository Institutions Act of 1982 deregulated interest paid on checking accounts (creating competition on the basis of interest rates paid) and allowed savings and commercial banks to offer money-market accounts modeled after money-market mutual funds. To help savings banks pay higher interest, their reliance on long-term, low-interest residential mortgages was reduced. Nonresidential mortgages were allowed to rise from 20 percent to 40 percent of the assets of a savings-and-loan bank (S&L). Similarly, consumer loans were increased from a maximum of 20 percent to 30 percent of assets; and commercial loans from 0 to 10 percent. In addition, agency-level regulatory change allowed thrift institutions (S&L's and savings banks) to invest limited funds in nonbank subsidiaries, to engage in real estate lending without regard to location or market area, and to make construction loans for up to 100 percent of preconstruction appraised value rather than the then-customary limit of 70 percent (Bryan, 1991; Pierce, 1991; Southern Finance Project, 1992).

In sum, thrift institutions were allowed (and the market compelled them) to engage in riskier lending. So long as deposits are insured, however, depositors do not judge the security of banks'

assets. In addition, as loan losses reduce the net worth of the bank company, its owners become more highly leveraged, facing risk on ever-smaller amounts of net worth, and increasing the bidding for lending and deposits in hopes of increasing profits that can be added to net worth. The resultant moral hazard is for increasingly risky behavior, not punished in the marketplace for deposits or loans. Thrift institutions faced grave problems during the 1980's, reflecting their limited scope, managements' limited experience, and the swiftness of major regulatory change.

Regulatory Response to Crisis

To date, the centerpiece of the U.S. Government's response to these difficulties is the Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA). The Act authorized funds "to shut down more than 500 insolvent S&L's, paying off insured depositors and liquidating the institutions' assets" (Pierce, 1991: 77), or to sell deposits and the more attractive loans to other thrifts or commercial banks. The Act addressed several aspects of the relationship between thrift institutions and commercial banks: the FDIC was given insurance, regulatory, and supervisory responsibility for S&L's (the Federal Savings and Loan Insurance Corporation [FSLIC] was eliminated); all thrift institutions (S&L's and savings banks) were assigned the same minimum owners' equity requirements as banks; thrifts were prohibited from investing in noninvestment-grade securities, such as junk bonds, and to maintain access to Federal Home Loan Bank funds, thrifts' loan assets had to be at least 70 percent mortgages and mortgage-backed securities.

FIRREA established the Resolution Trust Corporation (RTC) to manage and resolve all troubled savings associations, with these purposes:

> (1) maximizing the net present value return on the sale or other disposition of institutions or the assets of such institutions;
> (2) minimizing the amount of any loss from case resolutions;
> (3) minimizing the impact of these transactions on local real estate and financial markets;
> (4) maximizing the availability and affordability of residential real property for low- and moderate-income individuals; and
> (5) reviewing . . . cases resolved by the FSLIC . . . (for potential) savings" (Resolution Trust Corporation, 1991).

These purposes are not complementary. For example, an insolvent bank, targeted or placed in conservatorship of the RTC, has a perishable market value. The goal of maximizing the price received for the bank or its components requires speed of resolution. However, RTC evaluation of the bank and establishment of a reasonable minimum bid takes time. Speed in the sale of real-estate assets held by the bank may benefit the RTC, but would bring havoc to local real estate markets. Widespread Federal concern over the political acceptability of a protracted period of asset disposition has motivated substantial easing of RTC asset-sale terms, to include scheduled minimum-bid reductions on properties and financing for large purchases.

The RTC pursues resolution in three stages: *conservatorship* is the ongoing management and supervision of an insolvent thrift, with liquidity maintained via asset sales, earnings, deposits, RTC loans, litigation awards; *resolution* entails the selection of an acquirer, or determination that insured depositors should be paid off; and *receivership* is the actual closing of the thrift and

appointment of RTC as receiver or assets, so that RTC can dispose of assets according to the resolution worked out.

U.S. Government Proposals

FIRREA requires that thrift institutions meet the same requirements for equity capital as must commercial banks. New risk-based capital requirements recognize the varying riskiness of banks' assets, assign a risk level to nonlending activities that expose the bank to credit risk (for example, writing letters of credit on behalf of fee-paying clients), and determine capital requirements accordingly. The basic capital requirement is to become 8 percent, effective year-end 1992. The current proposal calls for consumer and business loans to carry the full 8-percent capital requirement, secured mortgages to require 4 percent, and cash and Government security assets to require none of the bank's own capital. This weighting will have a tremendous effect on banks' costs, and therefore willingness, to lend to different clients (Pierce, 1991).

In February 1991, the Bush Administration proposed substantial regulatory change for commercial banks. These proposals included:

(1) allowing nonfinancial corporations to own bank companies;
(2) allowing bank companies to open full branches (rather than separate bank companies or nondeposit operations) in multiple States;
(3) allowing banks to underwrite securities issues, to sell insurance, and to sell shares in mutual investment funds;
(4) consolidating the regulation of Federally chartered banks in one Treasury Department agency, and consolidating the Federal oversight of State-chartered banks in the Federal Reserve Board;
(5) restricting Federal deposit insurance to $200,000 per individual depositor at each bank, rather than $100,000 in each of any number of accounts (Labaton, 1991a).

Over the succeeding 9 months, tortuous debate, lobbying, and amendment of these provisions led to legislation in the U.S. House of Representatives to clarify and maintain many existing restrictions on commercial bank movement into interstate and intersectoral markets.[2] This legislation, quite different from the Administration's original proposal, failed on November 4 (Knight, 1991a and b). Because of the urgency of Congressional action to lend to and guarantee the FDIC's Bank Insurance Fund, narrow legislation followed to strengthen Federal powers to inspect and close banks (Berke and Wayne, 1991), and to increase the premiums paid by banks for deposit insurance. The only increase in commercial bank powers with any potential to become law before 1993 is now interstate branch banking (Rosenbaum, 1991). However, a widely

[2] In June of 1991, the House Banking Committee approved all elements of the proposal except changes to deposit insurance limits and changes to the Federal regulatory structure. Rather, the Committee suggested that all banks, credit unions, and savings banks be required to obtain Federal deposit insurance. In addition, the Committee voted to allow bank companies to be owned by companies that also underwrite insurance (Knight, 1991c). In July, the Senate Banking Committee proposed legislation that removed the nonbank ownership of banks and the co-mingling of bank and insurance companies or operations, that retained the current deposit-insurance coverage, that emphasized the need for the FDIC to close and dismantle troubled banks before insolvency, and that Federal bank regulation be consolidated in an independent rather than an executive agency (Knight, 1991d; Labaton, 1991b).

used provision in FIRREA allows commercial banks to purchase branches or entire franchises of failed S&L's across State lines and without paying generally required transition fees to the savings association or bank insurance funds (Southern Finance Project, 1992: 7).

Alternative Proposals

An alternative set of proposals entails a dual approach to regulation: (1) strict regulation of insured deposits, and (2) the total deregulation of all other banking activity. Pierce (1991) has noted that demand deposits (and the closely related payments function) represented only 37 percent ($1.2 trillion) of U.S. banks' domestic and international liabilities-and-equity at year-end 1989. Commercial and industrial lending represented only 18 percent ($609 billion) of banks' assets, or 30 percent of their loan assets. Consumer loans accounted for 9 percent of assets or 14 percent of loans. He suggested that only these portions of banks' activities--not the cash and security assets, not the real-estate lending, not the negotiable CD's, not the securitization of commercial or mortgage loans--need to regulated and insured. All the other areas of banks' operations, in which they compete against a myriad of other financial institutions, should be deregulated, keeping the core of the banking industry as a regulated, insured source of needed stability for depositors and small businesses.

The core-bank assets that remain are the heterogeneous, qualitative-information-laden, or small (under $100 million) and unpackageable loans. The liabilities that are capturable to support these assets via the expensive medium of the bank are insured deposits. These borrowers should pay their cost, and the depositors should not expect yields equivalent to noninsured loans (Bryan, 1991). An alternative proposal (Litan, 1987) called for Federally insured banks to invest all deposits in safe, liquid assets, such as short-term Federal debt. The resultant low yields on invested funds could drive many depositors and shareholders from the banking industry (Gilbert, 1988).

Interstate Regulatory Variation

Compared with the thrift subsector, the problems of commercial banks are mitigated by the broader scope of their operations (reducing, for example, the interest-rate risk that squeezed the thrift sector). However, the rate of commercial bank failures is rising, and this pattern varies by State. Overall, about 1.5 percent of extant U.S. banks failed in each of the 3 years (see table 2). However, the distribution is quite skewed. Ten States had only one bank failure during these three years; 18 had no bank failures at all during the period. Note the preponderance of outright bank failures in energy-producing States whose financial situations declined mightily in the late 1980's--falling too far too fast for mergers to prevent the fall of banks with substantial non-performing assets and declining collateral protection. In 1987, 59 percent of the failed banks were in Texas, Oklahoma, Louisiana, and Colorado. In 1988, these four States accounted for 77 percent of the country's failed commercial banks. In 1989, that percentage reached 84 percent. Table 2 notes the regulatory status of banking in these States. There is apparent danger in severe restrictions on statewide or interstate operations, which, when combined with poor economic conditions, yield high numbers of failed banks.

However, restrictive bank regulations alone did not yield high rates of bank failure. Illinois has long prohibited branch banking, though in 1982, bank holding companies (BHC's) were allowed to operate more than one bank within designated regions. Interstate bank operations were

permitted only with reciprocity, and only from certain neighboring States. This was modified at the end of 1990, to allow entry by BHC's from any State offering reciprocal entry. As a consequence of these regulations, Illinois has just under 1,200 banks. However, only three failed during 1987, 1988 and 1989.

Restrictive bank regulations also yield high numbers of *operating* banks in a State. Therefore, some of the States that lost the highest number of banks had the greatest number of small, localized banks. Nearly 300 Texas banks failed in these 3 years, but there were almost 3,000 banks in Texas at the beginning of 1987. Table 3 lists the States that lost the highest *proportions* of banks to failure.

Alaska, with very *liberal* bank-operation policies, lost the greatest proportion of its few banks, going from 15 banks at the beginning of 1987 to 10 banks in 1989. This probably reflects the dependence of the State's economy on oil-related revenues. The troubled southern oil-producing States also had failure rates much higher than the 1.5 percent national average--especially Louisiana and Texas, where the absolute numbers of failed banks have continued to climb as the numbers of independent banks dwindle. Both these States liberalized their restrictions on intrastate branching and interstate entry during the crisis of the 1980's, but these changes came *after* some banks had become abjectly poor candidates for acquisition.

Competition in Banking Markets

In the analysis of bank competition, the *local market area* (at the scale of the county, multicounty area, or metropolitan area) has generally been seen as the relevant market area.[3] This is accurate for certain banking activities, such as small deposits (not brokered deposits, negotiable CD's, or long-term non-negotiable CD's); and small- and medium-sized commercial loans (because of the relationship and information necessary to judge and to provide these loans).[4] From the perspective of bank customers, the transaction costs involved for small depositors, who make regular use of a bank for a range of functions, are greatly increased with distance. Similarly, small-business borrowers have relationships with fewer banks, and benefit from proximity to their multipurpose bank(s). The costs of finding and maintaining a satisfactory banking relationship do not increase proportionately with the amount of credit needed, and thus loom much larger for small businesses. Finally, the size of credit lines and the types of financial services demanded by

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[3] Hannan (1991) provided a useful test of the local-market-area hypothesis. Federal Reserve survey-based data on commercial bank loans, terms, bank characteristics, and local-market conditions were used to estimate the relationship between interest rate and the other variables. The explanatory power of equations that included local-area-specific data was significantly higher than equations that did not allow for regional differences.

[4] Dunham (1986) argued for the use of an additional geographic scale in analyzing commercial bank markets: the large functional economic region as the area over which medium-sized banks compete to offer credit and fee services to "the middle market," variously defined as companies that are not as widely traded or publicized as Fortune 1000 companies, as companies with $1 million to $100 million in annual sales, or companies demanding $0.5 million to $10 million lines of credit. Competition for serving these companies is increasing, as very large corporations obtain more financing through securities markets. Middle-market accounts benefit from ongoing banking relationships, but these relationships can bear moderate distances (perhaps 100-300 miles). Dunham found increasing concentration of mid-sized banks serving the middle market in three large New England regions, and suggested that this concentration be considered in Federal and State review of subsequent merger proposals.

Table 2--Commercial bank failures in selected States, 1987-89

State	1987	1988	1989
United States	183	208	206
Texas[1]	50	115	134
Oklahoma[2]	31	24	12
Louisiana[3]	14	13	21
Colorado[4]	13	10	7
Minnesota[5]	10	7	5
Kansas[6]	8	7	5
California[7]	8	3	1
Arizona[8]	0	1	6

[1] Texas allows only very limited branch operations. In 1986, it began allowing interstate entry by BHC's from any State.

[2] Oklahoma has only recently allowed statewide branch operations resulting from bank mergers; BHC operations are limited. Interstate entry by banks based in the region has been allowed since 1987.

[3] Louisiana allows branch banks within a single parish and very limited BHC activity across the State. Interstate entry is allowed from States offering reciprocity.

[4] Colorado does not allow branch banking, though BHC's can operate banks across the State. Since July 1988, external acquisition of State banks has been allowed from neighboring States.

[5] Minnesota allows limited branching, though statewide BHC holdings are allowed. Interstate BHC entry is allowed within the region.

[6] Kansas allows only very limited branching, limited BHC activity within the State, and no interstate entry.

[7] California allows statewide branching. In July 1987, interstate BHC entry was allowed from States in the region; this was changed to nationwide BHC activity as of January 1991.

[8] Arizona allows statewide branching and interstate BHC entry.

Source: Federal Deposit Insurance Corporation, *Annual Reports*, various years.

smaller firms can be satisfied by any number of local banks with relatively low capital bases. From banks' perspective, transactions costs for small borrowers rise with distance, because much of the lending process entails analysis of information (income, credit-worthiness, soundness of revenues) obtainable from published sources for large firms but only by interview and inspection for small firms. This greater expense exacerbates the relatively low absolute return on smaller loans made to smaller firms, which provide less interest-spread or fee income for the lending bank (Elliehausen and Wolken, 1990). These demand and supply characteristics limit the geographic range of small-business bank markets. For the small depositor and the small-business borrower, local availability of banks is necessary for a competitive market.

Traditional View

In the *structure-conduct-performance* paradigm of industrial organization, concentration of market share among few competitors yields collusion or price leadership, which yields higher profits than a less concentrated market. There are two traditional measures of bank-market concentration:

Table 3--States losing the highest proportion of banks to failures, 1987-89

State	1987		1988		1989	
	Number	Percent	Number	Percent	Number	Percent
United States		1.3		1.5		1.6
Alaska (from 15 to 10 banks)[1]	2	13.3	1	9.0	2	20.0
Texas	50	2.5	115	6.5	134	8.9
Louisiana	14	4.7	13	4.8	21	8.3
Arizona	0		1	2.0	6	12.8
Oklahoma	31	6.0	24	4.9	12	2.6
Utah[2]	3	4.9	3	5.5	0	

[1] Alaska allows statewide branching and interstate entry by BHC's from anywhere in the United States.
[2] Utah allows statewide BHC operations. In the 1980's, statewide branching was allowed, along with interstate entry from neighboring States. In 1988, full interstate entry was allowed.

Source: Federal Deposit Insurance Corporation, *Annual Reports*, various years.

the proportion of total local deposits held by the three largest banks (CR3, where $0 < CR3 \leq 100$); and the Herfindahl-Hirschman Index (HHI), the sum of squares of each bank's share of local deposits ($0 < HHI \leq 10{,}000$).

At what point does concentration affect the pricing and availability of bank services? According to the Federal Reserve Board, the U.S. Department of Justice ruled in 1984 that "a market in which the post-merger HHI is above 1,800 is considered to be highly concentrated . . . . Justice is likely to challenge a merger that increases the HHI by more than 50 points." The Federal Reserve Board noted that the Department of Justice has agreed not to challenge mergers in such markets that increase the HHI by less than 200 points, because of the increased competition from nonbank financial institutions, not included in the calculation of bank market concentration (Board of Governors, 1991: 743). However, greater increases in local bank market concentration are widespread. Inspecting three largest proposed commercial bank mergers in 1991, the Southern Finance Project (1991) concluded that 99 counties in Arizona, California, South Carolina, and Washington would face an average increase in postmerger concentration of 634 points, to yield an average HHI of 2,995. In 27 of these counties, the postmerger HHI would exceed 3,600.[5]

Which institutions should be included in HHI? The Federal Reserve Board has begun combining the deposits of thrift institutions and banks in the calculation of HHI. In some cases, 50 or 75 percent of thrifts' deposits are included in the market; in some cases, 100 percent. This increases

[5] Chemical Bank and Manufacturers Hanover Trust; NCNB and C&S/Sovran; BankAmerica and Security Pacific.

the size of the local market and the number of competitors, making it harder to challenge merger proposals.

The Federal Reserve Board has been even more lenient in supporting mergers in very highly concentrated markets when the acquired bank has *failed*. In July of 1991, the Board reviewed the application of Fleet/Norstar Financial Group to purchase the "bridge banks" formed by the FDIC to operate the subsidiary banks of the Bank of New England. In the Willimantic, Connecticut, banking market, Fleet, with the largest market share, would be acquiring the Connecticut Bank and Trust franchise, with the second largest market share. As a result of the merger, Fleet will control 98.5 percent of the market's commercial bank deposits; its HHI will increase from 4,994 to 9,707! The Board decided to include all S&L deposits in the determination of market share, reducing Fleet's post-merger share to 38.4 percent, and increasing the bank-and-S&L HHI from 1,503 to 2,219. The Board ruled that this was an acceptable increase in concentration, because "any lessening of competition is outweighed by the important and substantial benefits" (Board of Governors, 1991: 754) of maintaining and recapitalizing the failed bank's operations. Several local banking markets in New England faced similarly large increases in concentration, yet the Board recommended approval of the Fleet/BNE merger as proposed.

In a study of the 620 rural counties of 14 southern States between 1986 and 1990, the Southern Finance Project (1992: 23) found that the entry of large (assets > $1 billion) banks and thrifts into 80 of these counties (in RTC and private-market acquisitions) generally *reduced* bank-market concentration levels. This reflects the very high concentration in most rural bank markets. However, the 78 counties in which the Federal Home Loan Bank Board or its successor RTC took control of 20+ percent of local bank assets faced sharply higher concentration, because of the nature of the resolutions taken.

Alternative Views of Competition

Under the "*efficient structure*" *hypothesis* (Demsetz, 1973), some firms (and particularly in certain industries) gain scale efficiencies with size. Those firms can take higher profits than their smaller competitors, a result that would not be yielded by collusion among firms facing similar cost structures. This hypothesis suggests that empirical correlation of market-wide profit rates with concentration levels can mislead the investigator. Instead, the profit rates of firms of differing sizes should be compared across markets. Higher profit rates for larger firms in concentrated markets, according to the hypothesis, may result from the firms' efficiencies. Alternatively, if larger firms have grown because of efficiencies, they may offer services at lower cost, gaining market share. Thus, rather than assuming that concentrated structures yield higher prices, investigators should inspect the relationship between concentration and pricing.

"*Contestable markets*" *theory* (Baumol et al., 1982; Spence, 1983; Cairns and Mahabir, 1988) holds that the lack of entry barriers (which depends upon technological, economic, and regulatory circumstances specific to an industry) yields effective competition, in that excess profits in a concentrated but contestable market will attract entrants. With contestability (the absence of strong entry barriers), the only stable situation for a contestable market is zero "real" profit. Contestability is aided by:

(1) the ability of assets (tradenames, equipment, plant) to be used in alternative activities,

(2) the availability of relevant fixed assets in a rental or contracted market,
(3) regulatory freedom of entry, and
(4) a market that will respond quickly to changes or differentials in prices offered.

Contestability can be observed in the frequent and rapid entry and exit of firms from a particular line of business.

Are local bank markets contestable? The following conditions suggest that these markets are contestable:

(1) there is potential competition from local S&L's and by commercial banks in other locations;
(2) financial tradenames and software systems are useful across a range of financial products;
(3) many assets can contracted out and/or leased;[6] and
(4) the regulatory restrictions on entry are falling.

On the other hand, (1) client contacts are an important part of commercial lending; and (2) national rates of entry and exit are not very high, though this varies greatly by local market (see table 4).

Table 4--Changes in number of FDIC-insured commercial banks, 1986-89

	1986	1987	1988	1989
Total at year end	14,209	13,722	13,137	12,713
Net change during year[1]	-208	-487	-585	-424
New banks	+257	+219	+229	+192
Failed banks	-141	-183	-208	-206
Mergers (excludes failed)	-339	-545	-597	-411

[1] Many components yield the net change during year, some of which are not shown on this table. For example, banks that dropped FDIC insurance are deleted from the FDIC's records during the year. Therefore, the sum of the new, failed, and merged banks does not yield the net change figure given here.

Source: Federal Deposit Insurance Corporation, *Statistics on Banking*, Table 101, various years.

[6] Unlike many industries, monopolistic competition in banking hinges on spatial markets rather than on trade names or product differentiation. Some of the fixed assets of greatest importance in banking--credit-assessment and servicing systems, check-clearing and payment systems--can be provided across local markets (economies of scale), or can be contracted from an external vendor. Other, local fixed assets, such as ATM networks, can be shared by contract with other banks or ATM consortia. Local bank branches and name recognition are more difficult to obtain quickly, except in the case of already-local S&L's and in the situation of the early 1990's, in which many bank franchises, complete with branch networks and name recognition, are available for sale--often with Government subsidy.

Effects of Bank Concentration

Gilbert (1984) reviewed econometric studies of bank-market concentration. Of the five studies that used survey data of banks' interest rates on business loans by type of loan, four found significantly higher interest rates in more concentrated markets. At mean values, a 10-percentage-point increase in the market share held by the three largest banks led to an increase in loan rates of 0.05-0.06 percentage points, a fairly low elasticity. The three studies of banks' service charges for demand-deposit accounts found no significant relationship between concentration and service charges.

Whalen (1986) took advantage of regulatory changes in Ohio and Pennsylvania to test the effects of increased contestability on the bank market-structure/profitability relationship. These two States liberalized the approval of intercounty branching in 1979 and 1982, respectively. In addition, Whalen noted that savings banks, which were especially large and strong in Ohio, received additional ability to compete with banks via the DIDMCA of 1980 and the Garn-St. Germain Act of 1982. Given these changes, he compared the market-structure/profitability relationship across counties, with annual figures averaged separately in each of three time periods: 1976-78, 1979-81, and 1982-85. For Ohio banks, average profit rates differed significantly across market-structure categories only in the first period, with higher profits in more concentrated counties. This example suggests that State and National deregulation of banks' geographic and industry entry did indeed reduce the profit benefit of local-market concentration, and supports the contestable-markets hypothesis. For Pennsylvania banks, the only significant relationship appeared in the last period, in the opposite direction.

Berger and Hannan (1989) used data from 470 banks in 195 local markets, over 10 quarters spanning the years 1983-85. The rates paid on money-market demand accounts were 0.47 percentage points higher in the least concentrated market (CR3 = 25) than in the most concentrated market (CR3 = 100). This result is similar to the studies above. All these results are in keeping with the structure-conduct-performance hypothesis. Berger and Hannan obtained very similar results when HHI was used, and when CR3 and HHI included savings-bank market shares. They also found very similar results for other interest-bearing instruments, except for long-term non-negotiable CD's, which they reasoned face substantive nonlocal competition.

Local Effects of Commercial Bank Restructuring

Analysis of U.S. financial-services change must occur at several geographic scales. One of the most common scales of analysis has been the scale of the United States's large, multistate regions. It is at this scale that the greatest number of commercial bank mergers have occurred, and that common problems in banks' real-estate lending have been noticed. This large-regional scale has a regulatory basis in the agreements among neighboring states to allow interstate bank holding companies, and an economic basis in the rolling recession that has differentially affected the large regions of the United States, with their varying dependence on exports, financial services, and military expenditures.

However, the crisis and restructuring of financial institutions are also intensely <u>local</u> phenomena. Households and small businesses--the parts of the economy most bound to local regions--overwhelmingly rely on local banks for key savings, payment, and borrowing functions.

Employment growth in the financial sector was an especially bright part of many regions' outlooks in the 1980's, as financial-services companies expanded their scope of functions and their geographic competition. Real-estate development, with banks and thrifts as a linchpin, became a major industry in some local areas; in these areas, the bankruptcy of developers, the caution of lenders, and the Government acquisition of foreclosed properties are the salient determinants of Governmental tax and expenditure patterns. From the perspective of bank companies, despite the far-flung lending patterns of large and even moderately sized banks and thrifts, the economic health of very local regions determines the performance and viability of most American banks.

Direct Employment Impact

What happens to local bank employment when a bank fails, is acquired and merged into another bank, or acquires another bank? Given the labor intensity of branch-bank operations, and the importance of branches to retail-bank competition, the varied characteristics of each form of restructuring are important determinants of the local employment impact.

The outright failure of a bank and payout of insured depositors is very rare for U.S. commercial banks. In the more common cases of savings banks, the headquarters, back-office, and branch operations and employment disappear. The only exception are branches that may be purchased and operated by existing banks. As opposed to failure and outright closure, bank mergers (or, as has become common in the past two years, the acquisition of a failed S&L by a commercial bank) have different outcomes, depending on the relative locations of the merger partners. Mergers within the same geographic market yield duplicative headquarters, back-office, and branch operations to be rationalized at substantial loss of employment. This effect is reduced when more than one local bank acquires an insolvent institution: competition among the acquirers for retail bank markets will keep more branches open. Acquisition by a bank new to the local market, for antitrust reasons more common when the acquired bank is not insolvent, results in less duplication and less employment loss in the acquired bank's region. The losses are heaviest among highly paid headquarters staff. Regulatory prohibition against intercounty or interstate branching, and resultant acquisition by the establishment of a holding-company subsidiary, reduces the amount of back-office and systems rationalization and employment reduction.

A key question for local economies is whether displaced bank employees find employment in other local financial institutions. After the demise or absorption of a bank, we would expect the institutions that remain in a region to increase their employment in order to serve local banking demand. If that does not happen, the implication is that the local market is shrinking (perhaps having led to the failure or merger of a bank), or that there was excess capacity in the earlier market. The remaining institutions may be able to absorb the demand for deposits, loans, and services with little or no increase in enterprise-specific employment, because of unrealized economies of scale.

This question of displaced bank employees can be investigated empirically by inspecting regional employment change in banking sectors after bank closures or mergers. A simple investigation was made using *County Business Patterns* and FDIC data from 1987, 1988, and 1989. Data were collected at the State level and the commercial banking sector; a fuller investigation should inspect county and Metropolitan Statistical Areas (MSA's) and the combined employment of commercial and savings banks. Several relationships were tested: with no lag, a 3-month lag, and

a 1-year lag between changes in banks or branches and changes in employment. These relationships were as follows:

(1) proportional changes in States' bank employment, as a function of changes in the number of banks;
(2) proportional changes in States' bank employment, as a function of changes in the number of banking establishments;
(3) changes in States' bank employment as a proportion of their total employment, as a function of changes in the number of banks; and
(4) changes in States' bank employment as a proportion of their total employment, as a function of changes in the number of banking establishments.

Each potential relationship suggests that bank employment is a function of the number of banks. The first two relationships measure bank employment directly, while the last two relate changes in bank employment to changes in overall employment. The relationships also differ in the measure of banks: bank companies, among which mergers or closures can consolidate headquarters and back-office functions, and branches, among which mergers or closures may eliminate direct-service personnel.

These relationships were tested by a series of simple regression analyses. The only analysis yielding any strength was (1), estimating States' proportional changes in commercial bank employment from March 1987 to March 1988 as a function of changes in the number of commercial banks in the States from year-end 1986 to year-end 1987. In this case, containing a 3-month lag between the change in bank companies and changes in employment, the two appeared weakly positively related. This relationship contained a positive value for the coefficient of change in the number of banks: 0.53, with a standard error of 0.23. The proportion of explained variation (R-squared) was only 0.10, however. In all other cases, no relationship at all appeared between changes in the number of banks or of branches in States and the States' employment change in commercial banking. This suggests the complexity of the determinants of bank employment: bank failure versus merger, location of the acquiring bank, technological change in banking markets, degree of excess capacity in local banking markets, and competitive structure of local markets (influencing the competitive impact of closing branches versus modifying employment among branches).

Location of Regional Banking Centers?

Despite the local nature of key retail and small business banking markets, the increased importance of other bank services and the interstate purchase of banks increase the possibility that certain financial centers will export banking services, thereby gaining income and employment from sales beyond their local markets. However, local variation in bank-related employment reflects more than interregional imports and exports of bank services. Local demand for bank services varies in the region-specific, cyclical nature of credit demand.

Browne (1991) used interstate variation in 1989 location quotients to determine the exportability of various services, including banking. She concluded that "banking . . . appears to be very locally oriented" (Browne, 1991: 37). She hypothesized that New England's large location quotients for bank employment resulted from the synergistic growth of real estate development in the region

during the 1980's, as opposed to major exports of the region's banking services.[7] This hypothesis bears further investigation. In the 1980's, U.S. tax regulation and banking regulation produced huge amounts of speculative real-estate development. In certain regions of the country, substantial portions of local economies became devoted to the economics of growth: construction, real estate, finance (of development and of purchase), design, planning, utilities, and so forth. What proportion of employment (and of cyclical unemployment) depends on the expectation of further development? How will the restructuring of the financial sector affect this broad-based growth sector?

The combination of localized markets for financial services and interregional bank holding companies implies a geographic as well as organizational hierarchy. What are the likely determinants of the balance of operations at various levels of the hierarchy, and of their location? Banks that are riding a wave of interregional acquisition (Bank One, NCNB) may see net employment growth in their home regions, wherever those home regions are (re)located.

Increased concentration and interregional control are manifested in many ways. Within U.S. metropolitan areas, the proportion of bank employees working for small banks (less than 100 employees, typically with under $100 million in assets) declined slightly from 25 percent in 1980 to 23 percent in 1986 (see table 5). The proportion of employees in medium-sized banks declined steadily and substantially, from 24 percent to 19 percent. Large, in-State banks (over 500 employees and with assets of $1 billion or more) increased their share of metropolitan employment from 48 to 52 percent, while branches of large banks headquartered in another State increased their employment share from 3 percent to 6 percent (Cromwell, 1990). In the rural South, over half of deposits transferred from failed S&L's were purchased by thrifts or banks new to, and based outside the county (Southern Finance Project, 1992: 17).

Table 5--Distribution of commercial bank employment by size of bank, 1980-86

Percent of metro-area employees in:	1980	1986
Small banks	25	23
Medium-sized banks	24	19
Large, in-State banks	48	52
Large, out-of-State banks	3	6
Total	100	100

Source: Cromwell, 1990.

> How much interregional hierarchy is likely? One forecast suggests it is possible to envision 10-15 very strong multiregional [commercial] banks, each with 3-5 percent of the Nation's deposits, or more . . . most would be headquartered in regional centers like Columbus, Charlotte, Detroit, and San Francisco. Each would have

[7] "New England's location quotients for these [financial] industries were considerably lower (closer to 1) earlier in the decade" (Browne, 1991: 37).

> from $100 to $200 billion of deposits and earn from $1 billion to over $2 billion per year . . . formed primarily from consolidation of the largest 120 BHC's. They would . . . lend to individuals, small businesses, and mid-size companies . . . . There is still room in this future world for thousands of well-run local and community banks, and dozens of well-run smaller regionals, as well, who would continue to succeed through providing superior service to customers at the local level (Bryan, 1991: 198-199).

The location of these regional centers is of substantial importance, and cannot be assumed from current patterns. Not every regional center is destined to become a center for newly integrated financial services; the rise of Charlotte, Atlanta, and Columbus as bank headquarters cities reflects peculiarities of regional economic fortunes, State banking regulation, bank corporate strategy, and particular bank executives (Holly, 1987; Lord, 1987; Lord, 1992). Aside from these unique considerations, the benefits of agglomeration and of scale suggest that relatively few, dispersed, larger metropolitan areas will benefit from consolidated financial-service operations (Leyshon et al., 1989). In October 1991, NCNB announced that the "General Bank" (the core commercial bank) of NationsBank would be headquartered in Atlanta (the original home city of C&S), rather than Charlotte (NCNB) or Norfolk (Sovran) (*Fairfax Journal*, 1991). However, the holding company's corporate headquarters will be in Charlotte.

Local Availability of Credit?

One major role for traditional banks, we have seen, is in commercial lending to smaller clients, whose small credit needs and specialized characteristics make securitization difficult and direct lending by investors unrealistic. We have also seen that, aside from households, payment and credit services to small- and medium-sized businesses have the most localized market areas of banks' activities.

The changing institutional structure of banking creates two kinds of problems for these clients: more restrictive lending patterns, and higher capital costs. These problems stem from two sources: increasingly concentrated local banking markets, and the disruption of bank failures and mergers. I have presented expectations and findings regarding higher capital costs in more concentrated markets. With respect to capital availability to individual companies, the very information intensity that makes small business lending so dependent on local branch networks also makes these linkages susceptible to reevaluation and restriction by the managers that take over the assets of a failed or merged bank, or by the managers of a surviving bank in the same local region.

One investigation of middle-sized bank closures within 217 metropolitan areas, and employment change in medium-sized nonbank establishments found a significant relationship. This relationship was stronger and more significant than the relationships between closures of banks of other sizes

and nonbank employment overall.[8] The implications are that middle-sized banks (100-500 employees) are most important to local commercial-credit availability, and that middle-sized borrowers are the most sensitive to local credit availability. The reduction in middle-sized, nonbank employment did not carry over into the next 2-year period after a region's spate of bank closures.

Gilbert and Kochin (1989) modeled the impact of rural bank failures on rural sales-tax receipts and nonagricultural employment, across all counties of Kansas, Nebraska, and Oklahoma, and using multiple lag periods. Failed banks that closed had a greater negative impact than failed banks that were merged into surviving banks. In counties experiencing closure of a failed bank, the steepest declines in sales-tax revenue--6 to 13 percent--occurred 3 to 4 quarters after the closure. The average decline in county employment, 10 months to a year after a closure, was only 2 percent in Kansas, but was 20 percent in Oklahoma. Gilbert and Kochin estimated the size of declines in retail sales that might be attributed to the losses of uninsured depositors of failed banks, and the size of employment declines attributable directly to job losses at closed banks. In each case, the observed sales and employment losses were much greater than the estimates of direct bank-closure costs, suggesting that credit disruptions accounted for most of the counties' sales and employment losses after bank closures.

Short of failure or merger, "mere" declines in bank profitability can have immediate results beyond the pockets of shareholders. New England's severe contraction in business and consumer credit in 1990-91 resulted from the corrosive effect of commercial banks' low or negative profits on their capital base. A bank facing insolvency (insufficient equity capital to support outstanding loans) has several options:

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[8] Cromwell (1990) used U.S. Establishment and Enterprise Microdata to investigate the relationships between bank-establishment openings, expansions, closings, and contraction, on the one hand, and nonbank-business employment, on the other. This relationship was investigated across 217 U.S. metropolitan areas, for changes over the 1982-84 and 1984-86 periods (there were thus 434 observations, two time periods for each SMSA). The data were subjected to a series of single-equation multiple regressions, in which end-of-period nonbank employment was regressed on regional economic conditions that included bank-establishments components of change and beginning-of-period nonbank employment. Bank changes were disaggregated by employment size of the bank companies: under 100 employees, 100 to 500 employees, more than 500 employees, and more than 500 employees with out-of-state headquarters. The most significant result was the relationship between closure of middle-sized bank establishments (with a closure rate of four percent--about 50 bank closures--across all the SMSA's in both time periods) and end-of-period nonbank employment. When Cromwell estimated separate regression equations for SMSA's' end-of-period employment by size of nonbank firms, the most significant relationship was in the model of middle-sized firms (100-500 employees): "a ten-percent decrease in bank employment from [mid-sized] bank deaths . . . represents a 3.2 percent drop in midsized [nonbank] firms' employment" (p. 22). The model yielding this result included measures of SMSA's' production-worker wage rates, State corporate tax burdens, and SMSA's' employment at the beginning and the end of the study periods. The model explained 91 percent of the variation in SMSA's' end-of-period employment. The employment loss from mid-sized bank closures was the most significant and the largest of the bank-related measures in the model.

Despite the size and significance of the impact of medium-size bank closures on SMSA employment, the impact was smaller and not statistically significant when the dependent variable was changed to SMSA's' employment in medium-sized nonbanks in the following time period. Cromwell concluded that the credit disruption after a bank closing that seems so important to medium-sized firms is rectified within one or two years by the establishment of relationships with other banks in the region.

(1) add to capital via new issuing new stock--unlikely given the dismal returns to equity in New England banking;
(2) add to capital via retained earnings--but there are few earnings to retain;
(3) reduce capital requirements by selling loans to other financial institutions or by securitizing loans (creating debt instruments that can be traded in secondary markets)--this is possible for only certain types and quality of loans;
(4) reduce capital requirements as outstanding loans mature by reducing lines of credit and restricting new lending (Syron, 1991).

Option 4 represents a major source of the fabled credit crunch facing the U.S. economy. Given the local nature of loan markets, the regional nature of most banks and bank holding companies, and the regional nature of real-estate depreciation, credit crunches are largely regional phenomena.

The historic and defining role of thrift institutions is the financing of residential mortgages, usually in a local area. While FIRREA strengthened the residential-loan requirement for thrifts, thrifts as a group have lost deposit market share in some markets, a result of commercial bank acquisition of S&L's, of deposit flight from S&L's, and S&L charter changes to commercial bank status). This loss changes local markets for home mortgages, opening up niches for finance companies (nondepository lenders) who specialize in high-interest loans and mortgages to poor-risk households and small businesses (Southern Finance Project, 1992).

There is another important geographic scale of bank deregulation, that of the community or neighborhood. Increased competition and scale requirements have led banks to abandon neighborhoods with low and declining household incomes and small businesses. The low household incomes, small deposits, low business capitalization, and small-size loan demand in these neighborhoods make them especially costly to service. The restricted mobility of poor, elderly, and handicapped residents, as well as their exclusive demand for locally oriented retail services, make them especially dependent upon local banking services. New forms of banking services and other substitutes for banks (credit unions, S&L's, money-market mutual funds, direct lending from investor to business) are not generally relevant to these neighborhoods (Obermiller, 1988).

Looking Ahead

The forces behind bank consolidation are probably unstoppable. What is required now is understanding of the effects of consolidation, and public policy that channels these forces toward stability and growth within and across regions. Partial deregulation, or deregulation combined with Government subsidy (for example, in the form of subsidized deposit insurance, should the Bank Insurance Fund remain insolvent), subverts the operation of markets. *Forms of organization and competition need to be encouraged that will fill the holes left by the changing nature of commercial banking.* Given the expense of the information and operating systems required by new-style commercial banks, these alternative forms will have to rely upon firms that sell services from these systems, or find ways to minimize their use of these systems. Credit unions are one possible form of alternative institution. Savings and credit pools centered around a close-knit community or ethnic group are another alternative. We need to understand the potential and the limits of these and other alternatives, when they are combined with third-party information,

operations, and financial services (including secondary financial markets for investing and obtaining funds).

Increasing concentration of local banking markets results from local and interregional competition, failure, and mergers. We can tentatively conclude that concentration does increase costs of bank services, although slightly. The effects of concentration are reduced as nonbanks and near-banks are allowed to use new organizational forms and technologies to provide an array of financial services. Among the organizational forms will be the contracting out of many services, and the development of greater scale economies in their production. Contracting-out will allow small, independent banks to remain viable. So long as independent, large-scale, efficient suppliers of (wholesale) financial systems and services are available, retail banking markets are contestable by new and small entrants.

The centralized production (if not distribution) of key financial services, increased securitization of loans, and dominance of multibranch banks and multibank holding companies will all increase the importance of standard operating procedures in loan origination. The potential losers are those in need of nonconforming loans, such as the indigent, the self-employed, the under-capitalized business, the new business. This situation increases our need to develop and encourage new forms of retail finance.

At the local-regional scale, rationalization and scale increases will make banking a growth or an economy-based sector for a relatively few places. For most local economies, employment in depository institutions will continue to decline for several more years, followed by greater stability than we've seen in a decade--unless regulatory and organizational changes place these local functions in another sectoral category altogether. The nonmarket-oriented operations--bank-company headquarters and back-office support operations--will be wooed with an even greater intensity, as their size and growth stands in increasing opposition to branch operations. The locational factors to which headquarters are most sensitive include a highly trained and a skilled labor force, availability of business and professional services, and elaborate communication infrastructures. The locational factors to which support operations are most sensitive include: a reliable and low-wage labor force and elaborate communication infrastructures. While focused attempts to attract these operations may be ill-placed, the kinds of public and private investments useful in such an attempt are also useful for a wide range of expanding economic activities.

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Changing Employment, Earnings, and Skill Requirements in Manufacturing: The Implications for Rural Workers

Lucy Gorham[1]

Introduction

In this paper, I want to discuss what I believe to be some of the consequences of manufacturing restructuring for the rural labor force, and for the U.S. labor force in general. First, I'm going to briefly present the results of some work I did with Bennett Harrison several years ago. This research shows how the distribution of high- and low-wage jobs has changed in rural areas over the past decade, both for the rural labor force as a whole and for those employed in manufacturing.

Following that, I want to discuss more generally what I think the consequences of industrial restructuring are for U.S. workers, both rural and nonrural, in particular, in terms of skill demand and what this means for workers with less education. I wish to make the point that it is wrong to conclude that, because the wages of less-educated workers have dropped both absolutely and relative to those of more-educated workers, what we need are policies that will send more workers to college or enable them to purchase skills training on their own, for example, through training vouchers. I want to argue that this supply-side approach to the problem of inadequately skilled workers cannot succeed by itself because it ignores the overall context in which U.S. employers operate.

Nonmetro Earnings Trends

My analysis of nonmetro earnings trends (conducted with Bennett Harrison of Carnegie Mellon University) uses the March Current Population Survey for 1979 and 1987.[2] I define low earners to be individuals whose hourly wage and salary incomes (WSI) would leave them below the official poverty line for a family of four people, even though they worked the equivalent of a year-round/full-time job. By this definition, in 1987 a low earner made $11,611 or less in annual earnings.[3]

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[1] The author is with the Joint Economic Committee of the U.S. Congress. The research which forms the basis of this paper was undertaken in collaboration with Bennett Harrison, Professor of Urban and Public Affairs at Carnegie Mellon University. The research was made possible by a grant from the Ford Foundation and the Aspen Institute. **Note:** The views expressed in this chapter are those of the author and do not necessarily represent the views of the U.S. Department of Agriculture.

[2] In an effort to minimize distortions caused by the business cycle, the year 1979 was chosen as a starting point because it was the last business cycle peak. The year 1987 was the latest year of continued economic growth for which CPS data were available at the start of the research project.

[3] The poverty line standard for both 1979 and 1987 was adjusted for inflation by the now-standard CPI-X1 deflator of the U.S. Census Bureau.

One problem in comparing workers' wages is that people's work experience varies enormously over the course of the year. Some people work year round and full time, others only part time or part year. How can these differences in work time be incorporated into an analysis of wages that gives an indicator that can be meaningfully compared across labor force groups?

The procedure is straightforward. From the CPS tapes, each individual's annual wage and salary income (WSI) is known. This income is divided by the number of weeks the respondent works, and then again by the number of hours the respondent usually worked per week. The resulting figure of hourly earnings is then multiplied by (52 weeks X 40 hours) to arrive back at a work experience-adjusted estimate of annualized WSI--what I refer to as the equivalent of a year-round/full-time job. Such an indicator allows seasonal, occasional, and part-time workers to be incorporated into a comprehensive count of how many workers are low earners and to compare their earnings with an annual poverty level.

I want to emphasize three primary results of this analysis of earnings. The first is that, for rural workers overall, the likelihood of earning low wages has increased while the likelihood of earning high wages has declined. This is true for both men and women, blacks and whites, and even for college graduates as well as high school dropouts. Second, the reasons behind this change in the distribution of earnings are far more complex than a simple shift away from manufacturing employment and toward services. In fact, the industry composition of nonmetro employment remained remarkably stable between 1979 and 1987. To understand why the distribution of earnings has changed, we need to understand what has happened within industries, not simply between them. Third, the net impact of these changes has been a growth in inequality, in particular, growing disparities between workers with and without any college education.

To begin, let's consider how nonmetropolitan workers did between 1979 and 1987. In 1979, 31.9 percent of nonmetropolitan workers earned below the poverty level for a family of four. By 1987, the percentage of nonmetropolitan low earners had risen to 42.1 percent, an increase of over 10 percentage points. While metropolitan workers also experienced a rise in the percentage of low earners, the increase was just over half that for nonmetropolitan workers--an increase of 5.5 percentage points from 23.4 to 28.9 percent. Thus, in 1987, nonmetropolitan workers were over 45 percent more likely to be earning low wages than metropolitan workers.

Have nonmetropolitan women and men been affected equally by the economic turmoil of the past decade? The answer is: yes and no. For women, the share of workers with low hourly earnings rose 10.2 percentage points between 1979 and 1987, whereas for men it rose by 9.4 percentage points. By this measure, then, women have fared somewhat worse than men but the difference is not dramatic. However, whereas the share of low earners rose roughly from 22 percent to 32 percent for men, it rose from 44 percent to 54 percent for women. Thus, in 1987, less than a third of nonmetro men workers were low earners compared with over half of all women workers.

If the past decade did little to boost the earnings prospects for nonmetro men and women, it did even less for nonmetro blacks. Rural areas have never offered great job opportunities to minority workers, and this was even more true in 1987 than it was in 1979. In 1979, approximately 30 percent of nonmetro whites and 40 percent of nonmetro blacks earned below the poverty level for a family of four. By 1987, these percentages had increased to 40 percent for whites and over 60 percent for blacks. (See tables 1 and 2 for more detailed information.)

The earnings trends for workers with different levels of education provide another reason for concern. Not only do nonmetropolitan high school dropouts and high school graduates show a sizeable increase in their percentage of low earners, workers with some college or with four years of college or more do as well (table 3). In 1987, over a quarter of all nonmetropolitan workers with four years of college or more earned less than the poverty level for a family of four, up from 17.8 percent in 1979. Workers with a high school education or less, however, have been the ones who have really lost ground over the past decade. For high school graduates, the percentage of low earners went from 29.2 to 43.4 percent, while for high school dropouts it jumped from 47.3 to 57.1 percent. As a result, the earnings gap between those with more and less education widened considerably.

Finally, regional differences between nonmetropolitan and metropolitan low earners are shown on Table 4.

Table 1--Percentage of low earners, rural and urban workers by race and sex, 1979-87[1]

	Rural		Urban	
Labor force group	1979	1987	1979	1987
White men	20.2	29.2	14.8	19.4
Black men	41.5	52.3	23.1	32.9
Hispanic men	29.5	48.5	22.5	36.6
White women	42.1	52.1	11.2	17.9
Black women	58.4	69.0	21.7	28.5
Hispanic women	58.0	69.8	16.4	22.6

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census Bureau data.

Table 2--Percentage of low earners, rural and urban workers by age, 1979-87[1]

	Rural		Urban	
Labor force group	1979	1987	1979	1987
Age 16-24	51.0	72.6	44.8	59.6
Age 25-34	23.5	38.5	15.8	23.0
Age 35-54	23.1	29.8	14.8	17.7
Age 55 and over	31.9	38.4	19.4	25.0

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census Bureau data.

Table 3--Percentage of low earners, rural and urban workers by education, 1979-87[1]

	Rural		Urban	
Labor force group	1979	1987	1979	1987
High school dropout	47.3	57.1	39.9	53.7
High school graduate	29.2	43.4	22.3	30.7
Some college	22.4	33.6	16.8	21.4
Four years of college or more	17.8	25.5	14.1	16.2

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census Bureau data.

Table 4--Percentage of low earners, rural and urban workers by region, 1979-87[1]

	Rural		Urban	
Region	1979	1987	1979	1987
New England	26.8	31.0	24.7	23.0
Middle Atlantic	26.3	37.3	20.8	23.9
East-North Central	27.6	39.0	21.3	29.2
West-North Central	32.8	45.0	25.8	28.7
South Atlantic	33.4	43.1	26.2	31.0
East-South Central	35.4	46.4	27.4	38.0
West-South Central	38.6	47.0	26.8	34.1
Mountain	32.6	43.9	26.6	31.8
Pacific	26.8	36.4	21.8	27.6

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census Bureau data.

The Role of Industrial Change

I now turn to examine more specifically what role industrial restructuring has played in changing the distribution of nonmetropolitan wages. Is the growth in the percentage of nonmetropolitan low earners between 1979 and 1987 due to shifts of employment between industries, for example, the decline of manufacturing and the growth of services?

From the evidence presented in tables 5 and 6, which analyze employment categorized into eight major sectors, the answer to this question would largely have to be no. The distribution of nonmetropolitan employment among these eight sectors remained remarkably constant between 1979 and 1987 (columns 2 and 3 in tables 5 and 6). While the share of workers employed in both durable and nondurable manufacturing declined slightly and the share of both business and distribution (B&D) services and consumer and social (C&S) services employment increased slightly, these shifts were not great enough to account for the 10-percentage-point increase in the overall share of nonmetropolitan low earners. Instead, our data show that the share of low earners increased within all eight industry sectors. Thus, the growing problem of low earners is more the outgrowth of changes in the internal structure of industries rather than of employment shifts between industries.

As was the case for all nonmetropolitan workers, the key to understanding the growth in the percentage of women and men low earners lies more in changes within industries, rather than in changes between them. When we break the labor force down by men and women (tables 7 and 8), the composition of employment between industries has not undergone dramatic change. Both durable and nondurable goods manufacturing show a small drop in their share of nonmetropolitan workers among both men and women, while both services categories show small increases. However, these shifts between industries are not large enough to account for the large growth of low earners among both nonmetropolitan women and men.

Table 5--Rural low-wage employment by industry, 1979-87[1]

	Rural employment		Low earners in industry		All rural low earners	
	1979	1987	1979	1987	1979	1987
Industry	Percent					
Agriculture	4.1	4.5	71.2	76.2	9.3	8.1
Natural resources	2.0	1.7	9.6	18.7	0.6	0.8
Construction	7.0	6.4	21.6	30.2	4.8	4.6
Durable manufacturing	13.9	12.0	14.2	22.0	6.2	6.3
Nondurable manufacturing	11.8	10.9	25.3	36.5	9.3	9.5
Business and distributive services	14.3	15.9	20.3	32.3	9.1	12.2
Consumer and social services	41.9	43.9	43.8	53.7	57.7	56.0
Public	4.9	4.8	19.2	22.0	3.0	2.5

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census Bureau data.

Table 6--Rural high-wage employment by industry, 1979-87[1]

Industry	Rural employment		High earners in industry		All rural high earners	
	1979	1987	1979	1987	1979	1987
	Percent					
Agriculture	4.1	4.5	2.7	2.7	1.1	1.8
Natural resources	2.0	1.7	30.9	19.1	6.2	5.0
Construction	7.0	6.4	16.4	8.2	11.6	7.9
Durable manufacturing	13.9	12.0	13.1	7.9	18.3	14.4
Nondurable manufacturing	11.8	10.9	9.4	7.4	11.1	12.2
Business and distributive services	14.3	15.9	15.2	10.8	21.8	26.1
Consumer and social services	41.9	43.9	5.7	3.8	23.9	25.5
Public	4.9	4.8	12.0	9.6	6.0	7.0

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census Bureau data.

Table 7--Distribution of rural employment by sex, 1979-87

Industry	Women		Men	
	1979	1987	1979	1987
	Percent in industry			
Durable manufacturing	8.2	7.1	18.5	16.3
Nondurable manufacturing	12.2	10.8	11.4	11.0
Business and distributive services	11.1	12.6	16.9	18.9
Consumer and social services	60.8	61.1	26.5	28.4
Public	3.9	4.5	5.8	5.0

Source: Author's estimates from Census Bureau data.

Table 8--Percentage of rural and urban low earners by industry and sex, 1979-87[1]

	Rural men		Rural women		Urban men		Urban women	
	1979	1987	1979	1987	1979	1987	1979	1987
Industry	Percent of low earners							
Durable manufacturing	10.0	18.4	25.8	31.3	7.0	10.5	18.6	22.4
Nondurable manufacturing	13.1	23.0	39.1	51.9	11.7	14.4	30.4	36.0
Business and distributive services	16.0	23.5	28.4	47.1	12.4	17.5	21.8	25.9
Consumer and social services	31.7	42.2	50.2	59.6	26.1	34.5	38.5	42.9
Public	15.0	15.2	26.8	30.5	6.8	7.7	20.8	17.1

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census Bureau data.

Turning now to a discussion of differences between blacks and whites, we find that, as was true for both men and women, the distribution of employment among industries between 1979 and 1987 has not changed dramatically for either blacks or whites[4] (tables 9 and 10). The one exception is that the share of black workers employed in the nondurable manufacturing sector increased 8.8 percentage points over this period, at the same time that the share of white workers employed in the industry declined slightly. If nondurable manufacturing were a high-wage sector, this shift would bode well for improving racial equality in wages. However, as we can see from table 10, nondurable manufacturing has a high percentage of low earners, particularly for blacks. Moreover, the likelihood of earning low wages in the industry if you were black increased substantially from 1979 to 1987--from 45.2 to 55.0 percent. While the share of white low earners in the industry also increased, still less than a third of whites in the industry were earning low wages in 1987.

While the shift of blacks out of durable manufacturing and into nondurable manufacturing is certainly responsible for some of the increase in the growing gap between black and white workers, I would argue that changes within each of these sectors are equally, if not more, important. Again in table 10, we see that in each sector, the percentage of low-wage black workers increased and that these increases matched or exceeded the increases for whites.

[4] Due to inadequate sample sizes, it was impossible to compare blacks and whites in all eight industrial sectors or to include Hispanics in the analysis.

Table 9--Distribution of rural employment by race, 1979-87

	Whites		Blacks	
	1979	1987	1979	1987
Industry	Percent in industry			
Durable manufacturing	13.8	12.0	16.9	13.8
Nondurable manufacturing	11.6	9.7	14.5	23.3
Business and distributive services	14.8	17.0	9.6	7.5
Consumer and social services	42.1	44.1	40.5	41.5

Source: Author's estimates from Census Bureau data.

Table 10--Percentage of rural low earners by race, 1979-87[1]

	Whites		Blacks	
	1979	1987	1979	1987
Industry	Percent low earners			
Durable manufacturing	12.4	19.7	27.5	39.4
Nondurable manufacturing	23.1	32.0	45.2	55.0
Business and distributive services	18.9	31.1	40.1	52.4
Consumer and social services	42.1	51.8	61.5	73.9

[1] Annual earnings adjusted for weeks and hours of work.
Source: Author's estimates from Census data.

Factors Underlying the Growth in Wage Inequality

One question we need to answer in order to understand what factors lie behind the growth in rural wage inequality is how unique this trend is to rural areas. Do nonmetro industry wage trends look very different from those in urban areas? The difference between nonmetropolitan and metropolitan industry wage trends lies not in whether the share of low earners increased between 1979 and 1987, but rather in how much it increased and in how high the levels were in both years. All nonmetropolitan industrial sectors showed a substantially higher level of low earners than metropolitan industries in 1979, and the increase in low earners between the two years was on the order of 50 percent higher in nonmetropolitan than in metropolitan areas.

In fact, the growth in wage dispersion appears to be ubiquitous. It is evident not only among sex and education groups and within industries, but even within fairly detailed occupation groups. Thus, the growth in earnings inequality among rural workers reflects a more general trend toward wage dispersion in the United States, particularly between more and less educated workers.

What accounts for this growing inequality? Research points to two factors which have driven up the demand for better-educated workers: the globalization of the economy, including trade, and to a lesser extent, immigration; and technological change, particularly the computer revolution. Between trade and technology, technology appears to be the more important factor. Recent research indicates that much of the growth in the college/high school earnings differential during the 1980's can be explained by the substantial wage premium received by those using computers on the job (Krueger, 1991).

On the issue of global competition, it is not trade per se which appears to be problematic, but instead the kind of imbalanced trade we've experienced over the 1980's where exports have lagged and imports have grown rapidly. In fact, export industries generally pay better wages to high school educated workers and are more likely to upgrade jobs for them. If we could get back to a more balanced trade picture, therefore, this would help. However, one estimate is that trade and immigration effects combined account for only 15 to 25 percent of the growth in the college/high school wage differential over the 1980's (Katz et al., 1992).

One might think that, because changes in trade and technology have affected most advanced industrialized countries, we would see the same growth in wage inequality in these countries that we've seen in the United States. However, this hasn't occurred for a variety of reasons. It is true that, in most other countries, the trend toward narrowing wage differentials found during the 1970's stopped, as it did in the United States. But no other country has had an increase in wage inequality of the magnitude found in the United States, and some have had none at all, most notably the former West Germany. Even in Great Britain, where wage inequality has increased some, one does not find the absolute decline in real wages for less-educated workers that one finds in the United States over the 1980's (Katz et al., 1992).

Several factors appear to be responsible for these differences. In Italy and France, national wage-setting institutions actively intervened to prevent wage differentials from increasing. However, because this strategy doesn't get at the underlying problem of changes in skill demand, it appears to be successful in the short run but eventually leads to economic and political problems (Katz et al., 1992). The second approach involves altering the supply of skills through a significant investment in the education and training of noncollege workers, a strategy employed successfully by Germany and Japan, among others.

Why do Germany and Japan invest in so much more training for their noncollege workforce? In Japan, one crucial factor is the system of long-term employment, in which both employer and employee make a long-term commitment to each other. Japanese firms also make explicit agreements with each other that they will not recruit skilled workers away from each other. Because employers know that they will recoup their investment in training over the worker's tenure, they have the incentive to train and the subsequent ability to upgrade their technology and increase productivity.

In Germany, training takes place largely through the apprenticeship system, which places graduating high school students into training slots in industry. A number of factors make the system work. Perhaps most importantly, labor unions are heavily involved at the plant level in every aspect of the system's operation. This ensures that real training occurs, and that firms don't abuse the system as a source of cheap labor. In addition, both workers and firms have an incentive to maintain their employment relationship over the long term. Because wage differentials are not large for the same occupation between firms, workers have little financial incentive to move from one firm to another. From the firm's perspective, Federal and State regulations impose substantial costs for laying off workers. The net effect is a training system, though not without its problems, which works well for most noncollege workers and which produces the skilled workforce needed to institute technology improvements and to increase productivity and wages.

In the United States, in contrast, we seem to have problems all along the way. Unlike Germany and Japan, we don't do a very good job of educating our noncollege-bound students through our high schools. Nor do we provide students with an adequate school-to-work transition program. Not only do workers arrive less prepared at their jobs, but the vast majority of firms feel little incentive to train more than a small fraction of their noncollege workers (Bowers and Swaim, 1992). The threat of losing their investment in training to other firms is real because of high turnover rates. And yet, research also shows that workers are more likely to have longer tenure at a firm if they have received formal job training, leading to a vicious circle (Bowers and Swaim, 1992).

This is a difficult problem to overcome. Neither the Japanese or German system is suitable to our industrial relations system or culture. One approach being recommended is to simply mandate that firms spend a certain amount on training. However, without the strong involvement of labor to monitor how funds are used, I would guess that, absent any other changes in a firm's incentive structure, the net new investment in training would be minimal. A second approach being suggested is to give workers training vouchers with which they can purchase training on their own. Even if you assume that workers can get the information they need to make good choices about what training will pay off, and what training the larger economy needs, this approach still ignores what happens once they get on the job. Currently, most firms are not upgrading the skills of their workers at a fast enough rate for the United States to maintain a competitive manufacturing sector. Workplace training is crucial for adopting new technologies and is not replaceable by more general outside training.

I don't have a specific system in mind which provides an answer to this dilemma. But I will throw out a few general principles which I believe an effective system needs to incorporate:

(1) Most obviously, start out with a better system of general education.

(2) Work with local firms in putting together a school-to-work transition system which includes some incentives for the noncollege-bound students to excel in high school. In Japan, for example, employers look at students' high school transcripts and their job opportunities are directly related to how well they have performed.

(3) By world standards, our labor turnover is extremely high. Both for good and bad reasons, I think this would be almost impossible to eliminate, though we might

be able to reduce it by placing greater burdens on employers for laying off workers. Because of high turnover, employers will need to be mandated to institute more training for their noncollege workers. In such a system, labor must be integrally involved in any workplace training system to ensure that it is not abused. This will involve setting up enterprise-based workers' councils, or some equivalent. Strengthening labor's position through labor law reform would also be a step forward in this regard.

(4) Anything the public sector can do to assist firms in adopting new technologies should be encouraged. Small manufacturing firms, in particular, need help in identifying and implementing new production technologies.

These are not small projects, and they must be accompanied by some long overdue investments in physical infrastructure as well. But unless we address these long-term competitiveness issues, the standard of living in the rural United States, and across the United States as a whole, will be in trouble.

The economic turbulence of the 1980's has created terrible difficulty for nonmetropolitan America. This difficulty is reflected clearly in the tremendous growth in the share of nonmetropolitan workers earning too little to raise a family of four above poverty, regardless of their region, sex, race, age, or educational attainment.

Equally disturbing is the fact that we appear to be moving further away from the goal of economic equality. The nonmetropolitan/metropolitan gap in earnings has widened, as has that between nonmetropolitan men and women, between whites and blacks, and between those with and without any college education.

One expected consequence of these developments is that more nonmetropolitan workers lived in poor families in 1987 than did in 1979, amounting to 9.4 percent of all nonmetropolitan workers in 1987 compared with 6.6 percent in 1979. This represents a 20 percent increase in the number of nonmetropolitan workers living in poor families in less than a decade. As disheartening as this statistic is, it significantly understates the extent of the problem because it excludes all those nonmetropolitan workers who are unemployed or who have left the labor force altogether.

The broader economic changes which have contributed to this turmoil in nonmetropolitan America do not show signs of a reversal in the short-term, though certainly the nonmetro economy became much more stable at the close of the decade than it was at the beginning. Certainly, having global economic trends swing back even further in favor of the nonmetropolitan economy would help. But, rather than wait for such uncertain developments, we would be better off to assist nonmetropolitan workers and communities to make whatever adjustments they can make now. But first we must acknowledge that creating a society of growing inequality runs counter to our deepest aspirations as a nation and that active intervention is called for.

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Lessons for Rural America from the Decline and Restructuring of Manufacturing in the Niagara Region of Canada

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Introduction

Manufacturing in both Canada and the United States remains a critical industrial sector; but in both countries it is experiencing a major transformation that results in reductions in labor requirements, shifts out of low-wage, low-skill, low-technology products, and a geographic restructuring that entails consolidation of operations and relocation to new production sites. Rural areas in both Canada and the United States continue to seek manufacturing industries as ways to expand and diversify their economic base. But rural areas tend to be characterized by a relatively unskilled work force, an inability to support a world-scale production facility, and an absence of essential producer or business support services. Thus, rural manufacturing most often takes place in relatively small branch plants that are part of declining industries. In addition, increased foreign investment in manufacturing establishments in the United States raises concerns over loss of control of the economy. And an apparent preference for nonmetropolitan locations suggests that more branch plants in rural areas are foreign owned, which further decreases local control.

All these changes make the experience of the Niagara Peninsula region of southern Ontario a useful study for rural areas interested in expanding their manufacturing base. While the area is not strictly rural, in the traditional sense of low-population density or great distance from urban areas, those rural regions engaged in a significant volume of manufacturing activity typically have similar attributes to the Niagara region. Even though there is a relatively high degree of urbanization, the region remains a major source of high-value agricultural products. Also, small communities that serve residential and service functions are home to a significant share of the population.

The development of manufacturing in the Niagara Peninsula through the 1960's reflected a combination of natural advantages, a suitable labor force, and Government incentives. The decline of the area, starting in the 1970's, reflected an erosion in these factors. In addition, manufacturing was based primarily on foreign-owned branch plants, which provides useful information on the perils of relying on external investment. Most importantly, the industrial base of the region developed in sectors that are typical of the types of manufacturing that rural areas continue to try to attract today--those with mature markets, relatively unsophisticated products, routine technology, and low to moderately skilled labor requirements.

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At present the area is undertaking major efforts to restructure the economy. While manufacturing remains a central part of the economic base, it is a different type of manufacturing that is developing. New manufacturing plants tend to be small, locally owned, and flexible in their outputs. This adjustment process also can provide lessons for rural areas.

The Context for the Study

Industrial decline is a common theme of recent writings on economic conditions in various parts of North America. For example, through the 1980's much was made of industrial decline of the Midwest, the farm financial crisis, and problems of rural areas in general. While the bulk of the analysis has taken place in a U.S. context, parallel adjustments have taken place in Canada. Although the root causes of the change are the same--shifts in global prices, changing international terms of trade, and continental business cycles--there are significant domestic factors that make consideration of Canadian adjustments interesting studies in their own right.

One example of adjustment in Canada is the Niagara region of southern Ontario, which has long been a part of the manufacturing core of Canada. Although the region has a number of small- and medium-size cities, much of the landscape is primarily rural, dominated by fruit and vegetable production. Prior to the 1980's, increasing urbanization, a greater dependence on manufacturing, and a continuing decline of agricultural production and green-space seemed to be the future of the region. In fairly recent times, debates over preservation of agricultural land versus industrial or residential development were the major causes of local controversy.

However, by the beginning of the 1970's, conditions had begun to change and plants began to close or downsize. The recessions of the late 1970's and early 1980's triggered the closing of major manufacturing establishments, many of which had been key components of the economic base of the area since the 1930's. While much of southern Ontario, particularly the Toronto area, boomed in the 1980's, the Niagara region collectively experienced slow growth, and the southern half of the region continued to decline. The 1990-91 recession has accelerated the decline in traditional manufacturing sectors to the point that there is now widespread question as to the future nature of the economic base of the region.

Communities in the region remain part of the industrial heartland of Canada, but, as a result of a collapsing manufacturing base, they have become an increasingly peripheral part. While the region is too urbanized to be considered rural, its problems are increasingly those of rural areas--incomes are falling, new jobs are scarce, the smaller communities are drifting out of the economic mainstream and, at best, have been able to maintain a stable population.

Because these communities are close to the main trade route between Canada and the United States, and in reasonable proximity to both Buffalo and Toronto, they have the potential to take advantage of greater continental integration. The opportunity to reorganize manufacturing in the area remains, but it will have to be in the context of continental market. The area also has the potential for further development of producer services, tourism, and recreation, and since it is one of the warmer parts of Canada, services for retired people.

The Development of the Region

The Niagara region makes up the southern half of the "Golden Horseshoe" that stretches from Oshawa to Niagara Falls along the western end of Lake Ontario. This region is the economic and geographic center of the Canadian industrial heartland that runs from Windsor to Montreal along the Highway 401 corridor. The bulk of manufacturing and business services in Canada is located in this corridor because of its geographical features and because of the path of historical development.

Following the American revolution, the Niagara region was settled by a mixture of loyalists and British settlers. Because of the moderate climate, access to the Great Lakes, and proximity to the United States, the area initially developed as a source of agricultural products. Manufacturing became increasingly important after Confederation as grain production moved west and the continental railroad system developed. The Welland Canal played a major role in the development process. Bulk commodities moving through the Great Lakes system had to pass through the canal. Since the canal was the limiting factor on the size of ship, the region became a desirable location for processing and storage facilities. The early development of hydroelectric power at Niagara Falls provided the region with a cheap source of electricity.

All of these developments gave the region a number of desirable features in the set of factors that were once considered critical to industrial location decisions. There was plenty of water along the lake shores, from rivers or from the canal. There was cheap power from hydroelectricity. The region had good transportation systems through the Great Lakes and was on a major U.S. rail line running from Detroit to Buffalo. It had good access to domestic, United States and European markets. The population was considered to have a strong work ethic, either as a result of being recent immigrants or because of a farm background.

Finally, Government policies favored the region. The "National Policy," first implemented by Sir John A. Macdonald shortly after Confederation in 1867, raised tariffs to foster the development of a domestic manufacturing sector to reduce dependence on the United States. At roughly the same time, the prairie wheat boom fueled demand for the products of this industry. The demand for armaments, the displacement of British production during the two world wars, and British preferential tariffs also contributed to the development of manufacturing in Canada, particularly in southern Ontario.

Regional Characteristics

The Niagara region is not a homogeneous area. Land quality varies greatly. The northern lake shore, below the escarpment, has some of the best agricultural land in Canada. Fruit and vegetable production and greenhouses provide high levels of farm income and the opportunity for a food processing sector. Above the escarpment, the first 10 miles of land are typically of good enough quality and moderate enough climate for fruit production. Just north of an east-west line that would pass through Welland, the soil becomes poorer and continues to decline in quality as you approach Lake Erie.

While the region has a relatively well developed road system, the southern half of the peninsula is not accessible by four-lane highway. As highway access has become increasingly crucial to

economic development, communities in the southern half of the peninsula have felt increasingly isolated. A major highway, the Queen Elizabeth Way (QEW) links Toronto and Buffalo, but travels below the escarpment through St. Catharines and the turns south along the Niagara River to Fort Erie. A four-lane branch from the QEW has been under development between Welland and St. Catharines for the last 25 years and should be completed in the next year. This will help Welland, but plans to extend the road to Port Colborne have been suspended, leaving the southern half of the region somewhat isolated.

The internal road system is good enough, and all communities in the region are close enough, that the region comprises one labor market and retail area. People work and shop throughout the peninsula. Historically, a significant number of people worked in the United States, although this is less common now. Cross-border shopping has always been an important feature of the Niagara Peninsula but, with recent tax changes in Canada, it has become a major blow to the local retail sector.

In 1991 the population of the region was 393,838. St. Catharines and Niagara Falls are the two largest communities in the region with 130,000 and 75,000. Welland is the third largest at 48,000, Fort Erie has 26,000, and Port Colborne has about 18,000 people. The balance of communities in the area consists of small towns and villages that had their origins as agricultural service centers, but are now typically bedroom communities for larger urban places.

Within the Niagara region, communities developed somewhat specialized niches within the manufacturing sector. Port Colborne, at the southern end of the canal, engaged in refining and grain milling and storage activities. These were supplemented by light manufacturing and chandlery activities. Welland, at the middle of the canal, developed a metal products sector that was oriented to metal fabrication, forgings and castings, textiles, and farm implements. In addition, Welland as a county seat had major local Government functions. Fort Erie developed as the Canadian suburb of Buffalo. It became the home to branch plants and distribution centers of U.S. firms that had a significant presence in Buffalo and wanted to manage their Canadian operations from the United States. Fort Erie also has a significant aerospace industry. The border crossing at Buffalo-Fort Erie is the busiest in the world and, as a result, Fort Erie has a major customs brokerage service sector. Niagara Falls developed a strong chemical industry as well as tourism. St. Catharines, the other county seat in the region, at the northern end of the canal, developed initially through textiles, food processing, ship repair and local government functions, but became a major automobile manufacturing center in the postdepression era.

Economic Dislocation

By the 1970's the Niagara area had become dependent on an industrial base that emphasized heavy industry and provided relatively high-wage unionized jobs, but those jobs required limited worker skills. The technology and facilities at many of these plants were often several decades old and most of the plants were subsidiaries of United States or British firms. While a number of the firms in the area exported a significant fraction of their production outside Canada, the primary focus was meeting Canadian needs.

In the 1970's many of the dominant firms experienced major disruption. This came from two sources. The first was low-cost foreign competition based on cheaper labor, cheaper materials, and newer technology. In addition, competition from newer, more sophisticated enterprises,

producing advanced products, also led to problems for manufacturers in the region. Progress in the GATT led to lower tariffs on manufactured products, and the entry of the United Kingdom into the European Community ended the system of Commonwealth preferential tariffs. Developing countries had mastered the technology associated with many of the core industries in the region.

In particular, the textiles, metal refining, and metal products sectors now faced low-cost imports. The grain trade in Canada increasingly moved through Pacific Ocean ports, which reduced the use of the Great Lakes shipping system. The chemical industry was hit by rising environmental standards, increased feed stock costs, and competition from abroad and from Alberta. Finally, the combination of high interest rates and a severe recession in the early 1980's delivered the decisive blow.

The northern part of the peninsula was less affected, since auto production in Canada had just entered a relatively robust period. This reflected earlier decisions by the domestic companies to move much of their large car production to Canada. When oil prices fell, sales of large cars accelerated, and Canadian auto plants prospered. In addition, St. Catharines benefited from the growth of Toronto and increased Buffalo-Toronto commerce.

In Port Colborne, the major employer, INCO, closed its nickel refinery in 1978 because of a combination of a shift to non-Canadian operations, global competition, and an upgrading of its primary smelter in Sudbury. Page-Hersey Tubes in Welland had not invested in new technology and could not supply the oil industry with the types of product it wanted. Atlas Steel lost sales to smaller scale producers with newer technology. Textile mills that produced sheets and denim clothing closed. Fort Erie was particularly affected by the economic decline of Buffalo and Federal Government policies that favored Montreal as the aerospace center for Canada.

Many of the mainstay companies that survived were sold by their parents to new owners. This development often resulted in further reductions in employment as the new owner slashed costs and integrated the facility into an existing production system. For a number of the plants that were sold, their principal asset was their sales force and client list. In these cases, the plant was closed and customers were served from other facilities.

The southern half of the region was particularly hard hit. The communities of Fort Erie, Welland, and Port Colborne were devastated. Not only had the firms that closed provided a major share of jobs in the communities, they had also provided much of the community leadership. Plant managers and senior executives had been prominent in civic organizations and the plants had supported local improvement efforts. The loss of the plants also meant the loss of these leaders.

Within the communities the most common reaction of the populace was disbelief. For a number of years people waited for economic conditions to improve and the companies to announce a recall. Many of the workers were second- or third-generation employees and had joined the company right after school. Older workers, in particular, had limited skills and faced a job market that would not pay them what they thought they were worth.

More than 10 years later, a considerable number of people still believe that the past will return. However, an increasing number are looking for a new future. The transition to this new future is

painful. Incomes are lower for many individuals. Job security has been reduced. People have left the community for other locations. New skills and markets have to be developed.

In the early 1990's the pattern of lost jobs is now affecting the northern part of the region. St. Catharines is experiencing a drastic shrinking of its automotive sector as General Motors closes two of its three facilities. In addition, Ford is closing a plant in Niagara Falls. The closings reflect the changing pattern of production in the industry. Old plants that were built to serve the Canadian domestic market are too small to serve a continental market. New forms of industrial organization and economies of scale allow one or two large facilities to meet continental demand. Similar patterns of shock by displaced workers are evident, but there is also a broader realization that the past will not return.

Trends in Employment Opportunities in the Niagara Peninsula

Information developed by the Niagara Region Development Corporation (NRDC) *Business Directory* was used to examine the employment situation in the region. The directory has been published annually since the early 1980's, and over time it has gradually increased the scope of the enterprises it covers. As a result, early issues do not cover the same sectors as later issues, nor are the same types of data collected[2].

Initially the NRDC Directory focused strictly on manufacturing establishments, but in the mid-1980's the scope of the directory was increased to include other nonretail establishments, including business services. As a result, a significant portion of the apparent growth in the number of business service establishments and service employment between 1986 and 1988 reflects this change. Although the intent of the NRDC is to fully enumerate all manufacturing and producer-service industries in the Niagara region, the data incompletely counts the total number of enterprises, since the primary means for inclusion in the directory is either self-selection by the owner or searches of telephone directories by NRDC staff.

As a result, the directory provides only a limited perspective on economic conditions in the region and the respective communities. In particular, only manufacturing and producer or business services are included in the directory. This excludes retail trade, which accounts for the largest number of establishments and employees in the area and various forms of government, which are also major employers.

However, since manufacturing and business services are generally seen as the broad sectors of the economy that generate income from sales outside the region, information on conditions in these sectors is particularly important. Standard export base theory argues that growth of an economy depends on expansion of the export or basic sectors. While nonbasic sectors supply support

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[2] For the analysis in this report the 1986-92 versions of the directory were used. The survey is based on information obtained from the individual company and there is no formal procedure for checking the accuracy of the information provided. More importantly, companies are identified for inclusion by either having been in earlier editions of the directory, by self-selection, or through surveys of business listings in local telephone directories. As a result, the degree of coverage of potential establishments is uncertain. In addition, one cannot conclude that the degree of coverage is uniform on a year-to-year basis, or from community to community.

goods and services to the export sector, such nonbasic sectors as retail and consumer services are only viable in an economy with a strong core of export-oriented business.

Rather than placing great faith in the particular number of firms or levels of employment reported for any particular year, the analysis examines general trends in the nature of the data. For example, one might expect that over time the NRDC will include a larger share of the total number of firms in the region and in any particular community. In addition, new firms are captured with some delay by the survey method so, for any given directory, the number of new starts in that year will understate the actual number. The biases in the data collection methods can be reduced by focusing on changes in the mix of industries and by looking at relative movements, over time, rather than absolute numbers of firms and workers.

The first type of analysis is based on an examination of trends in 2-digit SIC divisions based on a classification scheme used by the Southern Growth Policies Board (SGPB) (Rosenfeld et al., 1985). They group 2-digit SIC classes into industrial sectors that reflect the broad types of goods or services produced. In manufacturing, the four groups reflect the potential for future growth and whether the commodity is a durable good or not. Table 1 shows how the Canadian SIC system used by the NRDC maps into the SGPB industrial classification. This approach reflects a widely held theory that industries go through a cycle of expansion followed by contraction (Gittell, 1992). Thus, mature industries cannot expect great increases in demand for their products. Similarly, durable goods are subject to demand patterns different from non-durables.

Table 1--Types of industrial sectors in the Niagara Peninsula

Industry type	SIC groups included
Mining	Nonmetallic minerals
Construction	General contracting, trade contracting
Traditional nondurable	Food, beverage, leather, primary textiles, textiles, clothing, wood, paper & allied
Traditional durable	Furniture & fixtures, primary metal
Emerging durable	Fabricated metal, machinery, transportation equipment, electrical & electronic
Emerging nondurable	Rubber, plastics, printing & publishing, refined petroleum products, chemicals & chemical products, other manufacturing
Urban services	Electric utilities, insurance companies, insurance/real estate agencies
Producer services	Truck/transport forwarding, storage & warehousing, business services, welding services
Consumer services	Deposit accepting industries, sheltered workshops, amusement & recreation services

Based on Rosenfeld, Bergman, and Rubin, 1985.

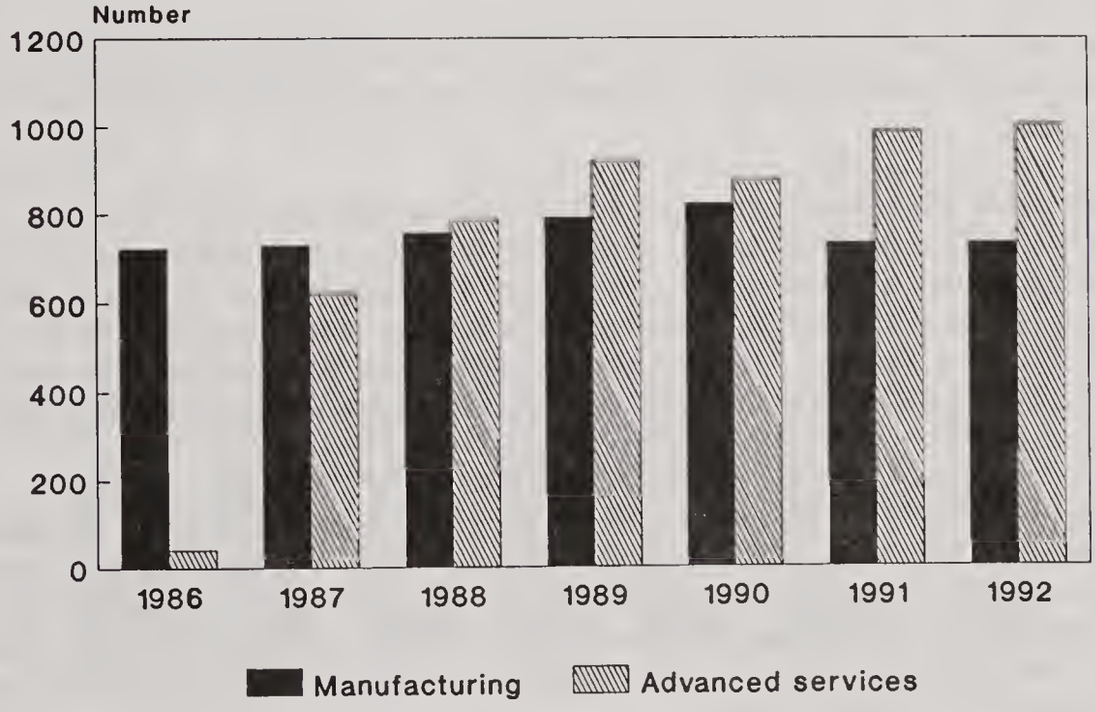
These SIC divisions provide a very broad brush overview of an economy. As a result, only broad inferences can be drawn about the basic structure of the Niagara region. Even at this level, however, we see important changes. Second, we will examine changes in the size distribution of firms as measured by employment. Third, we will look at the rate of business formation in the region. A final section looks at the importance of export markets to the region.

Changes in Industrial Mix

In the 1986-92 period, the NRDC data suggest a roughly 25-percent increase in the total number of manufacturing and business service firms in the region (figure 1). Virtually all this increase took place in the nonmanufacturing sectors. When lags in capturing new firms in the directory are considered, the share of nonmanufacturing firms in total establishments is likely to be even greater than the data suggest.

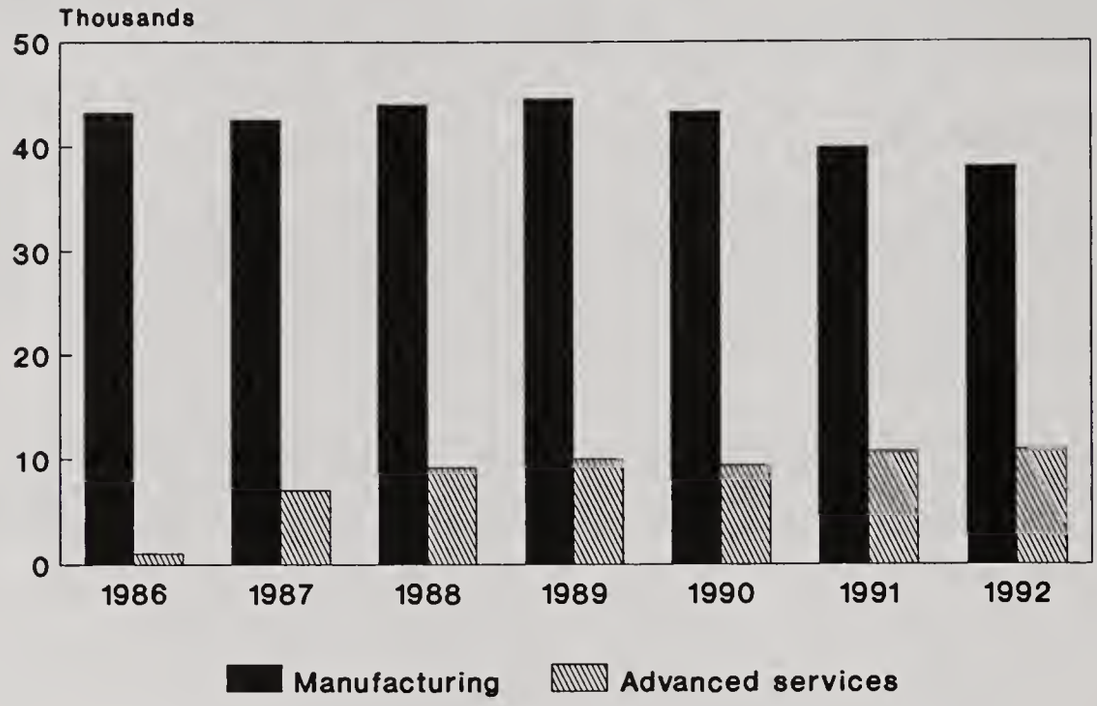
Similarly, total employment in all establishments included in the directory increased over the 1987-92 period (figure 2). In terms of employment, manufacturing continues to dominate the reported employment numbers, despite a small decline in the number of manufacturing workers over the

Figure 1--Number of manufacturing and advanced service firms, 1986-92



Service sector data incomplete for 1986 and 1987.

Figure 2--Manufacturing and advanced services employment, 1986-92



Service sector data incomplete for 1986 and 1987.

period. Thus, while growth in the number of firms was concentrated in nonmanufacturing establishments, the nonmanufacturing establishments did not generate a similarly large increase in the number of jobs.

For all manufacturing the number of workers per firm fell steadily over the period from 34 in 1987 to 26 in 1992. These statistics mostly reflect slow declines in the traditional durables and emerging durables sectors which dominate employment. This can be seen by looking at the average number of jobs per advanced service and various types of manufacturing establishments over the 1986-92 period (figure 3). In other sectors employment per firm remained fairly stable, so aggregate employment effects in these sectors are primarily the result of changing number of firms.

Over the period from 1987-92, there has been considerable reorganization of the manufacturing sector in terms of the relative importance of types of firms (figure 4). Employment remains dominated by emerging durables, notably automotive products, but its importance has fallen (figure 5). Similarly, the other three manufacturing sectors also account for a smaller share of employment. Producer services have expanded significantly from a small share in 1987, but still provide limited employment opportunities.

In terms of numbers of establishments, a different picture emerges. All the manufacturing sectors declined in share of total establishments, but producer services doubled its share of firm numbers to the point, where by 1992, with 30 percent of firms, there are almost as many producer service firms as manufacturing firms.

Figure 3--Workers per firm by type of industry, 1986-92

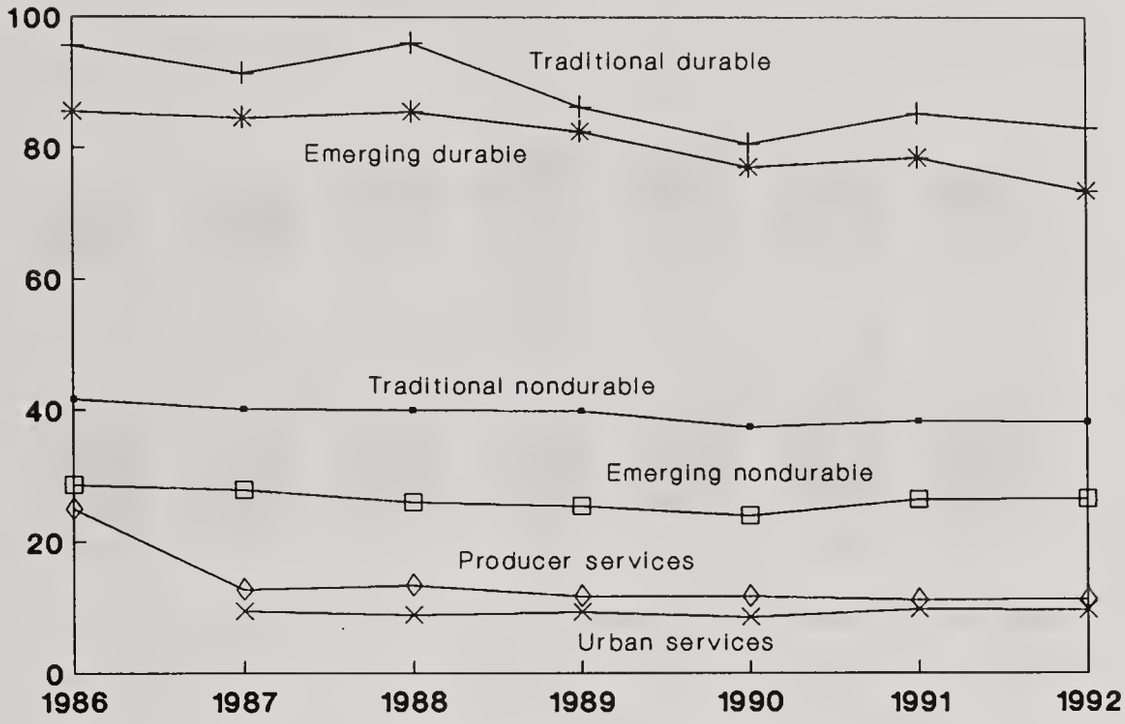
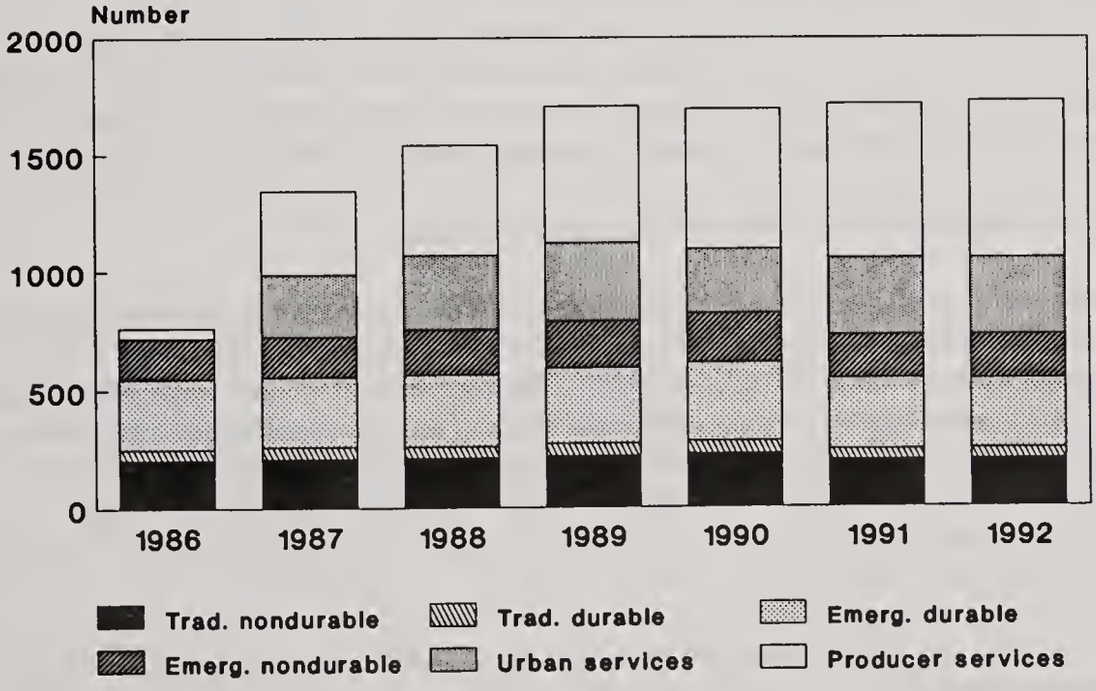
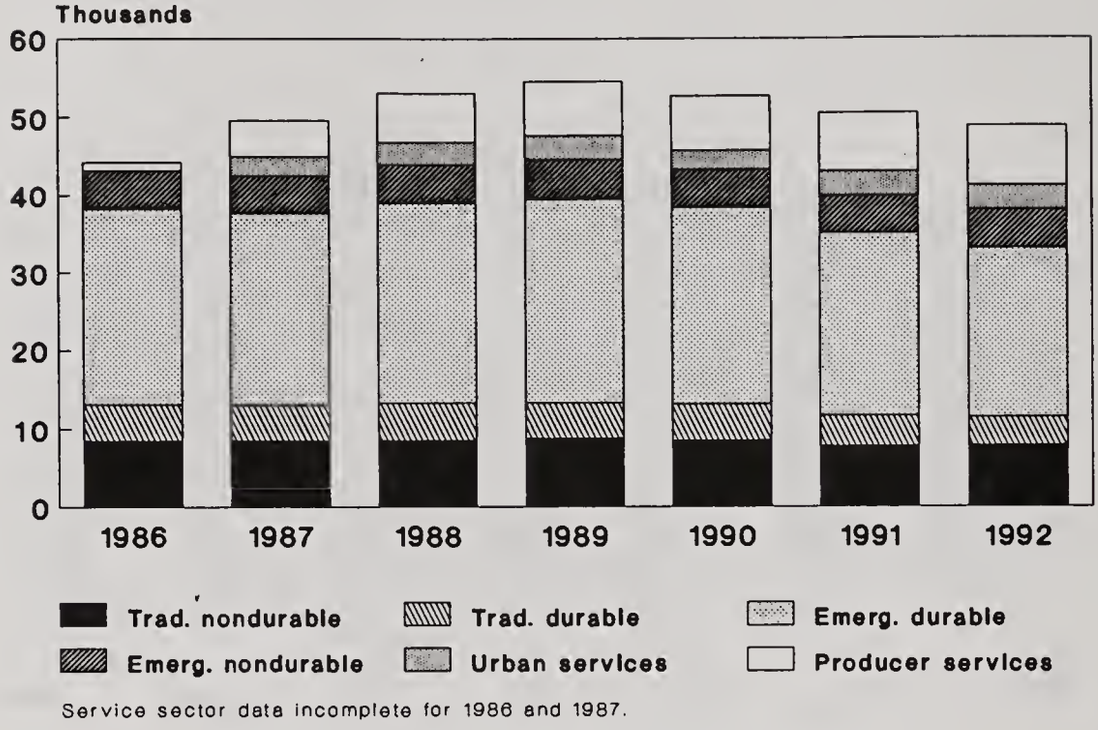


Figure 4--Number of firms by type of industry, 1986-92



Service sector data incomplete for 1986 and 1987.

Figure 5--Number of workers by type of industry, 1986-92



Service sector data incomplete for 1986 and 1987.

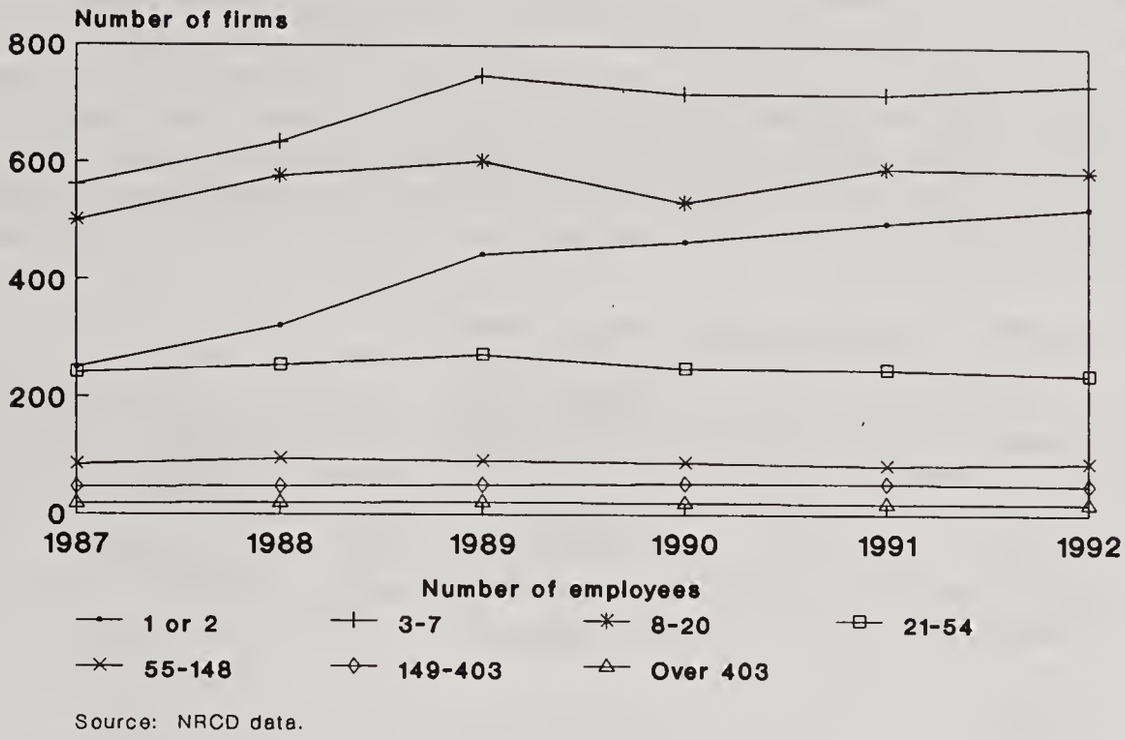
These data indicate how the nature of the industrial base is changing. Advanced services are becoming more important, but manufacturing remains the dominant source of employment in the region. The fact that emerging durables dominate the manufacturing sector, normally, should be grounds for optimism. However the automotive sector accounts for the vast bulk of the employment in this group. Even though the auto industry as a whole may have considerable growth potential, it need not mean that all the plants and current locations of that industry will grow. Recently, the region has experienced a series of auto plant closings. This points out the potential for an industry to be growing in a broad sense, while it contracts in a specific region.

Changes in Size Distribution and Rate of Business Formation

One way to characterize an economy is by the size of the firms involved. In recent times, great stress has been placed upon the importance of small business as the source of growth in employment and income. The NRDC survey asks firms to report permanent and seasonal employment. In this analysis only permanent employment is used since the duration of seasonal employment is not indicated. The basic technique for examining differences in the size distribution of firms is to look at simple frequency distributions for the Niagara region for 1987-92. As noted previously, these data should be interpreted with some caution because of the nature of the survey.

To facilitate comparisons, the data are grouped into seven size classes as shown in figure 6. These size classes were obtained by taking the natural logarithm of the reported number of employees in an effort to construct somewhat uniform size classes. However, even after applying the transformation, the percentage of firms with a small number of employees still vastly exceeds

Figure 6--Distribution of employment by firm size, 1987-97



Source: NRCD data.

those with a large number of workers. However, in terms of employment benefits to the community, it is important to remember that it takes 1,500 firms each employing two workers to equal the job creation effect of one firm employing 3,000 workers, particularly when differences in benefits for workers and ability to tap external sources of finance are considered.

Large firms employing more than 400 workers accounted for less than 5 percent of employment in both 1987 and 1992. The share of employment accounted for by firms with two or fewer workers grew rapidly over the period. For the region, these firms accounted for 14.7 percent of employment in 1987 and 22.5 percent in 1991.

The rate of new business formation is one of the critical factors influencing economic growth in a community. In particular, export base theory suggests that growth in the number of firms engaged in manufacturing and producer services is particularly important since these firms are oriented to sales outside the community. For the smaller urban places in the region, like Fort Erie, Port Colborne, and Welland, success in building these industries will be critical to maintaining the local economy.

Looking at the raw numbers suggests that the growth in employment in the region is occurring in small firms, just as in the rest of North America. Using the 1992 data, the employment distribution of firms established in 1987, or more recently, was examined. Of the 2,255 entries in the 1992 directory, 378 had started since 1986, and 179 since 1988. Of the firms that began after 1986, over 75 percent had three or fewer employees, and roughly half were engaged in producer services. Only four of the firms established since 1987 employed more than 50 workers.

Export Levels

Increasing integration of the economies of North America is placing greater pressure on companies that are engaged in the production of tradeable goods and services to seek markets outside national boundaries. The NRDC asks firms to report the percentage of sales that are exported, which provides an indicator of the region's ability to generate foreign earnings. Table 2 shows summary export data for the 1987-91 period. In general, there has been a slight decline in both the number of firms and the percentage of all firms reporting exports over the period. However, both the average and the median percent of production exported have increased for those firms that export.

Table 2--Importance of export sales in the Niagara Peninsula

Year	Number of firms	Share of sales
1987	473 of 1,722	mean = 21% median=10%
1988	502 of 1,970	mean=24% median=10%
1989	418 of 2,251	mean=28% median=18%
1990	423 of 2,146	mean=29% median=20%
1991	424 of 2,230	mean=28% median=15%

These data suggest that firms that began exporting in the mid-1980's under favorable exchange rates fall into two groups. Some withdrew as exchange rates became less favorable, while others were able to increase their export sales, and build the share of sales going to exports over time.

To examine the export performance of enterprises in the Niagara area that have significant levels of exports, firms in the NRDC directory that exported more than 20 percent of their sales were identified. In 1987 there were 169 firms, or 10 percent of the total number of firms in this category.

In 1991 there were 205 firms that exported more than 20 percent of their sales. This corresponds to just over 9 percent of the firms in the directory. Although this suggests a declining importance of exports, the industrial mix reported in the directory had changed between two periods. Over the 5 years, the major growth in types of firms covered had been in the service sector, particularly for nontradeable services. Correcting for this shift in composition results in an increased importance for exports.

By 1991, small firms made up a larger share of the firms that were dependent on export markets. Firms with two or less workers accounted for 5 percent of these firms in 1991 versus 2.4 percent in 1987. By 1991, firms with 20 or fewer employees accounted for 45 percent of the firms with exports greater than 20 percent of sales, as compared with 40 percent of the total in 1987. This is

despite the presence of a recession in 1991 and a relatively unfavorable exchange rate for Canadian firms exporting to the United States in 1991, particularly when compared with 1987.

Analysis of Taxfiler Data

The second major data source used in the analysis consists of taxfiler data based on postal codes, obtained from Statistics Canada. These data are developed from income tax files and provide information on income sources, selected demographic data, and number of taxfilers by postal code. Data for the years 1986 through 1990 period are available and the data series are generally comparable over time. These data provide information by city: St. Catharines, Niagara Falls, Welland, Port Colborne, and Fort Erie. For reference purposes, communities in the region will be compared to provincial and national values.

Because the data are based on postal codes, they do not correspond directly with municipal boundaries. These postal code data are used to develop information on changing demographics of the taxfiler population in each community, information on sources of income, and information on per capita and total levels of income. Sources of income include: wages, self-employment, unemployment insurance, interest, dividends, pensions, family allowance and other. The analysis is broken down in the following manner: (1) the number of taxfilers is examined, including the demographic composition, and (2) levels of income are considered, including total and per capita values.

Age Distribution and Number of Taxfilers

The first consideration is the changing demographic nature of the communities. In all cases there has been an increase in the number of taxfilers over the period. However, in Port Colborne and Fort Erie the increase has been small: 6 and 9 percent. The number of taxfilers in St. Catharines and Niagara Falls each grew by roughly 10 percent. Welland had the fastest growth at 14 percent, which is 2 percent less than the 16 percent increase for both Ontario and Canada.

All five communities are characterized by a decline in the number of younger workers. In Niagara Falls, Fort Erie, and Port Colborne, the number of taxfilers less than 30 years of age declined between 1986 and 1990, by 5.6, 8.8, and 8.6 percent, respectively. In St. Catharines and Welland, the number was roughly constant. Both Ontario and Canada also exhibited declines in the number of taxfilers in this age class. The decline in Ontario was quite small, less than 1 percent while, for Canada, the decline was 4 percent. Parallel to the drop in taxfilers in young age classes was an increase in the number in the number in the 65 plus class, which suggests an aging population structure. The increases for St. Catharines, Niagara Falls, Fort Erie, Port Colborne, and Welland were 55, 55, 44, 50, and 58 percent. For Ontario and Canada the corresponding increases were 55 and 56 percent. In part this reflects an increased number of older workers, but it is primarily the result of interest, and dividend and pension income.

Reflecting the shift in demographics was a shift in the number of people reporting different types of income. For all five communities, and Ontario and Canada, the fastest growing source of income in the period was pensions. The percentage of individuals reporting pension income grew by 5 percent in St. Catharines, Niagara Falls, Fort Erie, Port Colborne, and Welland, and by 4 percent in the Province and the Nation. Four of the five cities had roughly 25 percent of their

taxfilers reporting pension income by 1990, while Port Colborne had 31 percent of its taxfilers reporting pension income. By contrast, both Canada and Ontario had only 20 percent of taxfilers reporting pension income.

Earned income, in the form of wages and self-employment earnings, was reported by a smaller percent of taxfilers in 1990 than in 1986 in all five communities. The number reporting self-employment income increased in all communities over the period, but slow or negative growth in the number reporting wage income brought down the percentage of taxfilers with earned income. Port Colborne experienced an absolute decline in the number of people reporting wage income. St. Catharines, Niagara Falls, and Fort Erie experienced 5, 6, and 3 percent increases in the number of individuals reporting wage income, while Welland experienced a roughly 10 percent increase. All communities remain below the provincial and national averages in percent of taxfilers reporting wage income and self-employed income.

The number of individuals reporting Unemployment Insurance (UI) income declined in all communities but Welland over the period, while the number climbed for the Province and the Nation. Not surprisingly, UI income was reported by a smaller percentage of taxfilers in 1990 than 1986 in all five communities. The number of UI recipients bottomed in 1989 in all cases and increased in 1990 as the recession took hold. The ratio of the number of individuals reporting UI to the number reporting earned income shows a small decline for all communities over the period. This suggests that, although the active labor force is declining in number in these communities, a greater proportion was at work at the end of the period than at the beginning.

Income Reported by Taxfilers

All sources of income increased over the period, resulting in fairly large increases in total income. St. Catharines, Niagara Falls, Fort Erie, Port Colborne, and Welland experienced increases in total income of 38, 37, 36, 33, and 39 percent, compared with the Ontario and national increases of 50 and 46 percent. In a relative sense, the communities fell behind the larger aggregates. This is most apparent in the rates of growth of wage and self-employment income. In Ontario as a whole, self-employment income increased by 88 percent and wage income by 47 percent. Welland had the best performance of the five communities, with self-employment increases and wage increases of 58 and 34 percent, respectively. The comparable figures for St. Catharines were 57 and 32 percent; for Niagara Falls, 51 and 31 percent; for Fort Erie, 45 and 30 percent; and for Port Colborne, 23 and 28 percent.

When income shares by source are examined they moderate the conclusions drawn from looking at the number of taxfilers. Pensions and interest and dividend income were the only sources to increase their share of taxfiler income. However, the increased pension share of total income was far less than the increase in the percentage of taxfilers indicating pension income. Similarly, the decline in the importance of wage income was considerably less than the number of taxfilers would imply. All other income sources maintained almost constant shares of total income over the period.

Perhaps the best indicators of changing conditions in the communities are the movements in per capita income levels. These are derived by dividing total income by the number of taxfilers for each income component. *Thus, per capita in this sense does not refer to population averages, but to average amount per taxfiler.* In nominal terms most per capita income levels increased over the

period. However, the three smaller communities experienced a decline in per capita dividend income between 1986 and 1990, while St. Catharines and Niagara Falls experienced an increase, as did the Province and Nation. To the extent that individuals with relatively high levels of income and wealth are more likely to have dividend income, the decline could suggest a reduction in the level of income and wealth of this group in the smaller communities.

In Fort Erie, per capita total income grew by about 25 percent in the 5 years with wage income growing by 27 percent, self-employment income by 17 percent, and pension income by 28 percent. In Welland, total income grew by 22 percent with wages, self-employment, and pension incomes growing by 23, 20, and 23 percent. In Port Colborne, the corresponding increases were 25, 31, 8, and 22 percent. Self-employment income in Port Colborne was unusually low in 1990 compared with levels in earlier years. Niagara Falls experienced a 23-percent increase in per taxfiler total income, but a 25-percent increase in wage income and a 24-percent increase in self-employed income. Pension income grew by 22 percent. St. Catharines had the same increases in per taxfiler total and wage income as Niagara Falls. However, self-employed income in St. Catharines increased by 26 percent and pension income by 21 percent.

These growth rates in total income were only slightly lower than those for Ontario and Canada. However, there are major differences when the components of total income are compared. Wage income in Ontario grew by 32 percent and in Canada by 29 percent. Thus, wages for the workers in the major communities of the Niagara region failed to keep up with broader trends. Conversely, per taxfiler pension income in Ontario and Canada grew by 18 and 16 percent, which is less than the rates in the region. Most striking was the difference in self-employment income. In Ontario, the rate of growth was 51 percent while, nationally, it was 37 percent. Income returns to entrepreneurs in the region were far lower than in other parts of the Province and in other parts of the country.

A final comparison involves how income components in the communities compare with the Provincial average. In general, the region lost ground relative to the Provincial averages over the last 5 years. Only in terms of pension income are they close to the Provincial average, with St. Catharines, Niagara Falls, and Fort Erie exceeding the Provincial average for pension income. In terms of earned income, both wage and self-employment income declined further from the Provincial average in the 5 years. Per capita capital availability within the communities, as measured by interest and dividend income, also fell further behind the Provincial average. Per capita unemployment insurance income also fell further below the Provincial average, suggesting that unemployed workers in the communities had wage rates that were dropping relative to the Provincial average.

Implications

The data support a picture of the region that is consistent with that formed from other sources. They indicate an aging demographic profile with an increasing reliance on pension income as a component of total income. In addition, workers older than 65 are increasingly important in the labor force. Young workers comprise a declining proportion of the labor force resident in the communities. Wage income in the communities is not growing as fast as wages elsewhere in the Province. While the data suggest there has been a reduction in the number of unemployed in the communities over the last 5 years, those now collecting unemployment receive an increasingly smaller amount per capita than the Provincial average.

The number of individuals reporting self-employment income is increasing but the growth rate, in terms of numbers of individuals and per capita earnings, is well below the Provincial average. In addition, the pool of local investment income, measured by dividends and interest, is falling behind Provincial averages. This suggests the possibility of a limited local supply of business capital.

Economic Adjustment

One dimension of economic adjustment analysis that is becoming increasingly important deals with the notion of economic decline. Areas that develop a specialized economic base run the risk that the base will decline. The expansion and contraction of basic or staple sectors is a central theory of Canadian economic history (Easterbrook and Aitken, 1969; Marr and Patterson, 1980). The Niagara region is a classic example of manufacturing decline promoting a similar cycle. Other parts of Canada experiencing similar adjustments include the steel industry of Cape Breton Island, textiles in Montreal and Winnipeg, and meatpacking in the Toronto area.

Causes of Economic Decline

The striking component of the Niagara experience is the breadth of the economic base that was affected. In the Niagara region, virtually the entire manufacturing base has been in decline. This is not the typical example of the single industry town that loses its dominant firm. Instead, it was an almost systematic decline across a wide range of sectors. In addition, the decline took place in a geographic area that is difficult to characterize as being peripheral to continental markets and production. While a number of the industries that declined in the Niagara region experienced general decline in North America, such as steel and textiles, others experienced growth in other parts of the continent, such as aerospace, chemicals, and automotive.

There are a number of factors that can be identified as contributing to the collapse of the economic base. The first is a general lack of competitiveness of North America in certain sectors. These tend to be industries that have a long history in the region, and which have evolved to a point that they are characterized by standardized products, well-known technology, and a limited-skill labor force. For example, since 1950, the textile industry in the region was primarily based upon tariff protection, not on any comparative advantage. Other industries were affected by shifting patterns of trade and production. Smelters and grain processing declined because Canadian export markets shifted from Europe and the eastern United States to Asia. International competition also took away, or reduced, a number of Canadian export markets for ores and grains, which further lowered shipments through the Welland Canal.

Other firms declined because of changing patterns of competition and production within their sector. This is particularly the case for the automobile parts plants owned by Ford, General Motors, and the domestic auto-supply industry. Most of the plants in the region were designed to serve a protected Canadian market. With continental integration of the automobile sector, first through the Canada-United States Auto Trade Pact, and the proposed extension through the North American Free Trade Agreement, some of these plants were too small to achieve full economies of scale. In other cases, while the plant was a low-cost supplier, it was the smallest plant engaged in a particular activity. As the parent corporation shrank production capacity, the Niagara region plant was eliminated because adjustments in capacity were easiest to absorb by

cutting the smallest plant. Finally, because the domestic auto industry had a dominant presence in the area, it was difficult to attract new investment by Japanese or Korean competitors.

Another reason for the decline was the inherent branch plant nature of the Canadian manufacturing sector. While Canada maintained high tariff walls, branch plants thrived, but falling tariffs allowed rationalization of production. Not surprisingly, in a period of excess capacity, plants in larger home markets generally are selected for retention over smaller branch plants. Branch plants are less integral components of the entire production system so it is easier to eliminate them. For example, GM and Ford make plant closing decisions on the basis of corporate policies, not what is best for a particular local community. Even domestic operators of branch plants, such as INCO when it closed the Port Colborne smelter, make decisions on the basis of their aggregate interests.

Shifts in government policy also had an impact on the area. The growth of the region as a manufacturing center was initially encouraged by a protective tariff policy. A shift in trade policy to allow a more open economy, not surprisingly, had adverse impacts on the area. Other policies exacerbated the adjustment pressure. With growing continental integration, exchange rates become an important factor in explaining the competitive position of a region. The close proximity of the Niagara region to the United States makes it particularly susceptible to exchange rate fluctuations, since purchasers have the opportunity of choosing Canadian or U.S. suppliers. Unstable exchange rates make it harder for companies to engage in cross-border sales, while a too-high exchange rate can cost a company sales in both the domestic and foreign markets. Similarly, high interest rates through the 1980's reduced the incentive for reinvestment in capital-intensive manufacturing sectors.

Other forms of government policy affected the region. Programs to promote economic development in one part of the country led to problems in other areas. For example, the Canadian Government has tried to make Montreal the center of helicopter production in Canada by concentrating financial incentives and procurement in that city. A consequence has been a reduced role for the aerospace industry in Fort Erie. Industrial policy to stimulate economic development in one region may result in decline in another.

The magnitude of the change in the area and the wide range of causal factors suggest that a major restructuring of the local economy is taking place. Recent indicators of business formation suggest that there is a shift to business services and small-scale, locally-owned businesses. But the large branch plants continue to dominate employment numbers and value of production. The rise of indigenous entrepreneurs should lead to a broader base of leadership in the community, but in the short run, these people are too busy ensuring their economic survival to spend much time on broader goals.

Continental integration is reaffirming old ties between the southern half of the Niagara Peninsula and Buffalo. Fort Erie and other southern communities are as much influenced by conditions in Buffalo as they are by Toronto. The trade agreement is opening the border to competition at all levels of business. While the intent of the agreement was not to permit free trade at the retail level, it has effectively happened for many products. At the level of manufacturing and professional services, companies have to find a niche within either a continental or a regional system.

While trade is being stimulated by the reduction in tariff and nontariff barriers, other factors have a more ambiguous effect. Differences in tax levels, interest rates, and exchange-rate fluctuations make it difficult to integrate the two economies. Exchange rates and interest rates have become linked in a manner that influences business conditions. An appreciating Canadian dollar allows lower interest rates in Canada, but that reduces exports to the United States and increases imports, which slows the rate of business growth. However, a lower value of the dollar leads to higher interest rates and fears of inflation.

Within the region there appears to be a continual erosion of the influence of large corporations as sources of economic growth. In part, this erosion reflects the efforts of multinational corporations to rationalize production within the continent. While Canadian plants may be efficient in terms of unit costs, they were typically built to supply only the Canadian market. Expanding them to serve a continental market is rarely profitable, so they are closed. Further, the pace of closings is currently being exacerbated by the rapid removal of barriers that once shielded other plants from low-cost producers outside the country.

The Potential for Economic Recovery

There is reason to believe that the region has the potential to experience a revival of its manufacturing base. It is centrally located within the manufacturing heartland, with good transportation links. It lies between two important population centers. There are strong manufacturing skills in the workforce, although the skills need upgrading. And there is slow but steady growth in small-scale manufacturing that could provide the kernel for an industrial revival. As was argued in an earlier part of the report, a revival of manufacturing in North America is essential for a strong economy. If the revival takes place, it is most likely to take place in this region.

Hansen (1988) has argued that traditional views of a hierarchy of economic function are no longer correct. In the past, communities of a specific size had a well-defined set of functions with smaller communities only providing a limited set of goods and services. Hansen argues that changes in the nature of production, distribution, organization, and communication by both the public and private sectors have broken this rigid hierarchy. There is no longer a high probability that communities of a given size will serve the same function. The distribution of goods and services available in a community is now seen as reflecting chance, strategic behavior by either the community or an individual, or particular attributes of the community and region. In particular, smaller communities in reasonable proximity to large urban centers are able to borrow some of the scale effects of the large community and attract industries they could otherwise not support.

Parallel to this rethinking of the functions of cities is a new theory of industrial production that focuses on the idea of industrial districts (Harrison, 1992). By creating linked systems of production based upon informal agreements among a large number of small producers, it is possible to replicate most of the scale economies of a single large firm without bearing the associated costs of a rigid structure, high overhead, and inflexibility. The classic example of a region where this has happened is the "Third Italy" in the vicinity of Bologna, Florence, Ancona, and Venice. Piore and Sabel (1984) argue that the region's system of small manufacturers, who trade labor and equipment and form loose coalitions for particular jobs, is an example of how to develop a new manufacturing base in North America.

These two related ideas provide a strategy for revitalizing the manufacturing base of the region. The Niagara Peninsula already constitutes a single labor and retail market, so it is a logical step to develop an integrated industrial district. None of the communities is large enough to develop a continental scale industrial base by itself, but collectively the region could provide a broad mix of labor skills and support for advanced manufacturing. Part of this strategy would entail developing integrated job training programs on a region-wide basis. It would also require developing an industrial extension service to help firms organize production and marketing linkages. This strategy would be a logical extension of existing community specific business development services.

Lessons for Other Places

For over 50 years, the Niagara region was a significant component of the manufacturing heartland of Canada. In more recent times, the region has experienced major decline in its manufacturing base. The growth of the region was based upon a combination of natural advantage and government policy, and the region's decline reflects changes in those factors.

The industrial base that developed was dominated by heavy industry that was foreign owned, designed to serve a small domestic market, and dependent on specific sources of raw materials and markets. For a considerable period of time it provided relatively high wages and secure employment to a significant proportion of the labor force in the region.

But high wages for relatively unskilled workers increasingly came at the cost of high prices for the products that were produced. In addition, high-wage branch plants tended to preclude the development of locally owned manufacturing. Wage and benefit packages at the branch plants were high enough to make it difficult for small- to medium-size firms to attract and retain labor. In addition, the dominance of the branch plants contributed to a company town mentality, particularly in the smaller towns and cities of the region where plant managers provided leadership for the community[3].

New technologies, competing sources of supply, and new policies all contributed to the current decline. Advances in manufacturing and distribution methods made many of the industrial processes in use in plants in the Niagara region increasingly obsolete. At the same time, plant owners determined that it was not in their interest to invest in new equipment and capital since falling Canadian tariffs, increased economies of size, and opportunities for cheaper production elsewhere eliminated the need for Canadian production.

Areas contemplating manufacturing-based development can find some useful lessons. The first is that comparative advantage changes over time. Initially, the resource base and location of the region stimulated manufacturing but, as the role of raw materials in manufacturing declined and markets shifted, the region moved from being an advantageous location to one with few benefits. This notion has been well captured by Gittel (1992) in his study of small manufacturing communities in the United States.

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[3] This is not an uncommon phenomenon. The state of Michigan has experienced similar problems and there is a body of development literature, generically referred to as the Dutch Disease, developed from analysis of the adverse impacts of North Sea oil development on the Dutch economy.

The second point is that high wage branch plants do not bring an assurance of stable long-term development. While the level of capital invested in a plant may be large by local standards and seem to imply a long-term commitment by a corporation, in reality, the level of commitment is small. Branch plants by their nature are peripheral to the core business of the corporation and are the most easily sacrificed when conditions require downsizing. While branch plants do not require local capital to be established, they do result in profits being repatriated to home offices and investment decisions that do not consider local interests. In addition, high-wage branch plants inhibit the development of indigenous business by bidding up wages and reducing the likelihood of successful entrepreneurs developing.

A third point to be considered is the shifting nature of public policy. High domestic tariffs encouraged the initial development of the branch plants located in the Niagara Peninsula, but they also assured that the plants would be developed to serve a domestic market. As the costs to the Canadian economy from tariff protection rose and pressure for continental integration increased, the plants became too small to be competitive in the new larger market. Ultimately, shifts in public policy contributed to the demise of the plants, just as it contributed to their development.

A fourth point focuses on labor force skills and community stability. While there is no guarantee that a skilled labor force will lead to stable manufacturing-based development, a problem in the Niagara area is the inability of current levels of labor force skills to maintain expected levels of wages. Open borders allow most of the products that were made in the area to be produced at far lower cost in low-wage areas. Without skill development, workers will not be able to qualify for new high-wage jobs. There will be too few low-wage, low-skill jobs to maintain the current population, so workers will leave. One consequence of this is the aging demographic structure of the region.

Development plans for the region continue to emphasize manufacturing as a key sector for the future. In part, this emphasis reflects a belief that the comparative advantage of the region is in manufacturing. In part, it recognizes the limited potential for other sectors of the economy to absorb the local labor force. While there are efforts to expand the tourist base, attract additional service industries, and develop government-based employment, these sectors are not capable of replacing manufacturing.

Tourism facilities are well developed in the Niagara Falls area, and other peninsula communities have only modest attractions for visitors. Advanced business or professional services have some potential in St. Catharines or Niagara Falls, because of their size and good road connections to Buffalo and Toronto, but the short distance between these two major centers argues against the Niagara Peninsula becoming a major business service center. In response to the decline, the Provincial Government is locating the Ministry of Transport's main offices in St. Catharines and is considering locating the Ministry of Tourism in Niagara Falls. This could add several thousand direct jobs but, once again, manufacturing job losses exceed the number of Government jobs and there is limited potential for further expansion of the Government facilities.

Another option is expanding the retirement destination appeal of the region. The Niagara area is one of the more attractive climatic areas of Canada and has good access to major metropolitan areas in Canada and the United States with significantly lower costs. The area has seen a great increase in the importance of pension income and in the proportion of older Canadians in the

population. Like tourism, a retiree-based economy is a poor substitute for manufacturing. A first point is the limited desire of retirees to invest in local development, particularly in projects with long-run paybacks. It is also difficult to influence the pace of development, since immigration is the principal source of growth and the opportunities for building upon strengths are limited. Even with relatively healthy growth in pension income, there is little evidence of spillover benefits to communities.

This leaves manufacturing as the best hope for the future. But restoring the manufacturing sector will require developing it in a new form. Large branch plants still dominate the economy in terms of percentage of employment, but their share of total employment is falling. For small manufacturers to take full advantage of the local labor force skill base and the existing system of manufacturing support services, they will need some additional support.

In particular, support will have to come in three areas. Locally based small firms need help in market development and penetration that branch plants selling to parents do not need. This is critical for developing United States and Mexican markets. Firms will also need support in technical areas, including process development and worker training. Small firms lack easy access to engineering and design skills that are embedded in large firms. The peninsula already has a strong, engineering, consulting sector, but its focus has been on large firms and international projects, not small local business. Existing higher education institutions also have the potential to provide some of this support. Finally, small business will require stable access to capital. While branch plants could draw on the internal funds of the parent corporation or its credit standing, small business of any type has chronic problems of access to capital. Alternatives to traditional bank financing are needed to ensure credit constraints do not limit future growth.

Within the Niagara region there is a growing recognition of the need to address these problems. Both the Federal and Provincial Governments have programs in place that support manufacturing development, as well as other types of small businesses. In addition, local business and political leaders are beginning to realize that their individual well-being depends upon stemming the decline in employment and income in the region. As a result, there is a growing willingness to consider joint action, both within a community and among communities. In the Niagara Peninsula, just as in many other areas, it seems that it takes a major crisis to bring people to act in their long-run interest.

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